FLORA OF PANAMA

BY

ROBERT E. WOODSON, JR.

AND

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AND COLLABORATORS

PART II

Fascicle 3

ARACEAE (Standley)
LEMNACEAE
MAYACACEAE
XYRIDACEAE
ERIOCAULACEAE (Moldenke)
RAPATEACEAE
BROMELIACEAE (L. B. Smith)
COMMELINACEAE
PONTEDERIACEAE

ANNALS

OF THE

MISSOURI BOTANICAL GARDEN

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FLORA OF PANAMA

Part II. Fascicle 3

ARACEAE

By Paul C. Standley

Terrestrial or epiphytic plants, very rarely aquatic, herbaceous or often with elongate, suffrutescent caudices, frequently scandent by aerial roots, the terrestrial forms sometimes with tuberous roots, the caudices usually simple but sometimes branched, the foliage glabrous or very rarely pubescent, the sap watery or milky, often caustic; leaves solitary or few in the tuber-bearing plants, in caulescent ones alternate and distichous, or spirally arranged, very variable in form; cataphylls usually present, these narrow, membranaceous, often carinate, sheathing the peduncles or petioles; peduncles simple, terminal or axillary; flowers small, perfect and all alike or unisexual, arranged upon a cylindric, usually elongate spadix, this subtended by a spathe, the spathe various in form, persistent or deciduous, often colored; pistillate flowers, in unisexual plants inserted on the lower part of the spadix, the staminate on the upper portion; perianth usually none in the unisexual flowers, in the perfect flowers of 4–6 segments, these cuneate or obovate, truncate or incurved at the apex, imbricate or rarely connate; stamens in the perfect flowers 4–8 and distinct, hypogynous, opposite the perianth segments, the filaments dilated, the anthers terminal, dehiscent by dorsal pores or slits; stamens of the unisexual flowers 1 to many, distinct or united to form a peltate, prismatic, or sinuate synandrium truncate at the summit; ovary entire or very rarely lobate, sessile or immersed in the spadix, 1- to many-celled; style none, or short or elongate, terminal, simple, the stigma terminal, discoid, pulvinar, or capitate, sometimes sessile along the apex of the ovary and linear-oblong or rarely lobate; ovules solitary or numerous in each cell, sessile or affixed by a short or elongate funicle; fruits baccate, numerous in each spadix, free or connate, indehiscent, or suboperculate by the separation of the thickened apex, the cells usually filled with glutinous or mucilaginous pulp; seeds small or large, smooth or variously roughened, the endosperm commonly abundant and fleshy, rarely none.

The family is essentially a tropical one, abundantly represented in almost all warmer parts of America. A few genera besides those listed here are known from Central America. The group is a well-marked one, whose flower structure may be studied most conveniently, perhaps, in the common calla, *Zantedeschia aethiopica* (L.) Spreng., grown as commonly in Central America as in the United States. A noteworthy feature of the family is the presence in the foliage of

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needle-like crystals of calcium oxalate. If a piece of a leaf is chewed, these crystals penetrate the tongue, producing a burning sensation and swelling, the irritation sometimes persisting for many hours.

Most of the Panama Araceae are epiphytic plants, and they form a large percentage of the more conspicuous epiphytic vegetation upon trees of the humid lowlands, being rivaled in abundance only by the bromeliads. The foliage often is handsome and ornamental, and the inflorescences of many species are showy. While most of the plants thrive best in shade, their succulent leaves enable them to live in abundant sunshine. The literature of the Araceae is very extensive, chiefly because they have long been favorite plants in European hot-houses. The most recent and by far the most comprehensive monograph is that of Engler and Krause, Pflanzenreich IV. 23. Upon this the following treatment is based. In Central America the family is still but incompletely known, for lack of adequate herbarium material. The plants are succulent and difficult to dry and consequently are neglected by collectors. Moreover, although plants of a given species may be abundant, often it is difficult to find one with inflorescences. It may be stated that when named material is available for comparison, usually it is possible to name specimens from leaves alone.

A study of the development or life history of the Panama plants of the family would be instructive and useful from several aspects. Especially in such genera as *Monstera* and *Philodendron*, the juvenile and adult forms are so different that at first glance one never would associate them. The connecting forms are known or described in but few instances, therefore it often is impossible with present knowledge to name juvenile plants, although it is probable that all of them could be named if their variations were described.

The following key to genera has been prepared with the idea of making it practical rather than diagnostic by the technical characters, which often are difficult of recognition.

a. Plants aquatic, floating on the surface of water; leaves spongy, arranged in a basal rosette; inflorescence minute and scarcely visible ..... 1. PISTIA
aa. Plants terrestrial or epiphytic; leaves not spongy, never arranged in a rosette; inflorescence large and conspicuous.
  b. Leaves peltate, spotted with white or various colors. Plants terrestrial, naturalized; flowers unisexual, naked ..... 7. CALADIUM
bb. Leaves not peltate, green.
  c. Leaf blades perforated, sometimes also pinnatifid. Flowers perfect .. 4. MONSTERA
  cc. Leaf blades not perforated.
    d. Leaves digitately compound, pedately 3- to 11-cleft, pinnatifid, or trilobate almost or quite to the base.
      e. Blades two or more times divided, with very numerous small segments. Plants terrestrial; leaf 1; flowers perfect, with a perianth ..... 6. DRACONTIUM
    ee. Blades only once divided or cleft.
      f. Leaves pinnatifid. Plants epiphytic, with elongate caudices; perianth none.
        g. Flowers perfect, the spadix uniform ..... 4. MONSTERA
        gg. Flowers unisexual, the upper part of the spadix with staminate flowers, the lower with pistillate ..... 15. PHILODENDRON
      ff. Leaves trilobate, trisect, or pedately or digitately 5- to 11-parted.

g. Spathe spreading from the base of the spadix; flowers with a perianth ..... 2. ANTHURIUM
gg. Spathe, at least the lower portion, enclosing the spadix; perianth none.
h. Leaves triparted or trisect. Plants epiphytic, with elongate caudices.
i. Blades triparted to the base ..... 15. PHILODENDRON
ii. Blades trisect almost to the base ..... 14. SYNGONIUM
hh. Leaves pedately cleft, with 5 or more segments.
i. Plants terrestrial, arising from a tuberous caudex ..... 8. XANTHOSOMA
ii. Plants epiphytic, with elongate caudices ..... 14. SYNGONIUM
dd. Leaves simple and entire, often cordate or hastate-lobate at the base.
e. Flowers all or mostly perfect, the spadix uniform, not divided into a pistillate and a staminate portion.
f. Plants terrestrial, acaulescent.
g. Leaf blades acute to rounded at the base ..... 5. SPATHIPHYLLUM
gg. Leaf blades hastate, with elongate basal lobes ..... 3. UROSPATHA
ff. Plants epiphytic, at least normally so, usually with a well-developed caudex.
g. Stigma discoid; plants with short or elongate caudices ..... 2. ANTHURIUM
gg. Stigma oblong or linear; plants with elongate, scandent caudices.
h. Peduncles cernuous or recurved at the apex at or before anthesis ..... 13. STENOSPERMATION
hh. Peduncles erect at the apex.
i. Lateral nerves of the leaves reticulately anastomosing, the secondary and tertiary ones not parallel with the primary ones ..... 4. MONSTERA
ii. Lateral nerves of the leaves all more or less parallel, not anastomosing.
j. Ovary 2-celled ..... 10. RHODOSPATHA
jj. Ovary 2- to 6-celled ..... 12. ANEPSIAS
ee. Flowers unisexual, the spadix with two distinct portions, the lower pistillate, the upper staminate. Perianth none.
f. Plants epiphytic, at least normally so, the caudices more or less elongate and rooting at the nodes ..... 15. PHILODENDRON
ff. Plants terrestrial, acaulescent, or with erect caudices supported by prop roots.
g. Leaf blades chiefly oblong, rounded to very shallowly cordate at the base ..... 9. DIEFFENBACHIA
gg. Leaf blades hastate or cordate, with a deep basal sinus.
h. Plants glabrous.
i. Caudex erect, usually prickly and supported by prop roots ..... 16. MONTRICHARDIA
ii. Caudex hypogean, tuberous ..... 8. XANTHOSOMA
hh. Plants pubescent.
i. Stamens distinct ..... 11. HOMALONEMA
ii. Stamens connate to form a 5- to 6-angulate synandrium ..... 8. XANTHOSOMA

1. PISTIA L.

PISTIA L. Sp. Pl. 963. 1753.

Plants aquatic, floating on quiet water, acaulescent or nearly so, the caudex very short, often emitting stolons with new rosettes of leaves at their end, these later becoming detached from the parent plant; leaves numerous, crowded, spirally arranged and forming a rosette, thick and spongy, covered on both surfaces with short, crowded, few-celled hairs; stipular sheath free almost to the base, thin and

scarious; inflorescences very small and inconspicuous, subsessile; spathes foliaceous, whitish, glabrous within, pilose outside, somewhat constricted at the middle on either side, the margins connate to the middle, the blade ovate, acute, subcucullate; spadix shorter than the spathe, adnate for two-thirds its length to the spathe, the pistillate portion 1-flowered, the staminate 2- to 8-flowered, the flowers verticillate; flowers unisexual, naked; staminate flower with 2 stamens, these short-connate, forming a sessile, oblong-ovoid synandrium slightly depressed at its apex, the anther cells opening each by 2 vertical slits; ovary monogynous, ovoid, obliquely attached to the spadix, 1-celled; ovules numerous, orthotropous, sessile, 4- to 6-seriate; style short, terminal, the stigma obtuse, subhemispheric-penicillate; fruit baccate, ovoid, many- or few-seeded, irregularly rupturing; seeds cylindroid, slightly attenuate at the base, subtruncate at the apex, excavate at the middle; endosperm copious.

The genus consists of a single species, almost pantropic in distribution. In general appearance, as well as in structure, the plant is quite unlike any other member of the Araceae, and it constitutes a separate subfamily, Pistioideae. The morphology is discussed in detail by Engler, Pflanzenreich IV. 23F:250-258, *fig. 63, 64.* 1920.

1. PISTIA STRATIOTES L. Sp. Pl. 963. 1753.

Plants emitting numerous long, slender roots; primary leaves rounded or broadly obovate, the adult ones numerous, spreading to form a dense rosette, obovate-cuneate or obovate-oblong, broadly rounded or emarginate at the apex, cuneately narrowed to the rather broad, sometimes subpetiolate base, mostly 5–10 cm. long and 2–5 cm. wide, with 5–15 parallel nerves, these prominent beneath, the blades green or grayish green on the upper surface, pale beneath.

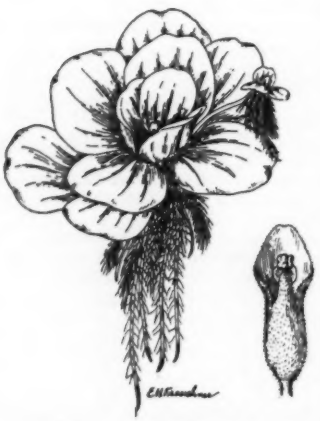

Fig. 73. *Pistia Stratiotes*

Generally distributed in tropical regions of the earth except (according to Engler) Polynesia and Micronesia, floating on the surface of quiet pools or streams, and often completely covering the surface of small pools.

Common in the lowlands throughout Panama, chiefly at 100 meters or less.

The English name is "Water Lettuce;" the most common Spanish name of Central America *Lechuga de Agua*, but others are *Lechuga de Sapo*, *Repollo de Agua*, and *Verdolaga de Agua*. The plant often is grown in aquaria in the North.

2. ANTHURIUM Schott

ANTHURIUM Schott, Wien. Zeitschr. Kunst 3:828. 1829.

Plants almost always epiphytic, rarely terrestrial and then perhaps only by accident, the caudex short or sometimes elongate and subscandent, the internodes short or elongate; petioles short or elongate, short-vaginate at the base, always geniculate near the apex; blades usually coriaceous or thick-coriaceous, rarely thin, very variable in form, simple or rarely digitately compound; peduncles commonly elongate, the spathe generally persistent, often colored, narrow, spreading from the base of the spadix, often decurrent at the base; spadix sessile or stipitate, cylindric, conoid, or caudiform, densely many-flowered, usually green or violaceous green, more or less elongate in fruit, flowering from the base upward; flowers perfect, perigoniate; sepals 4, often as broad as long, fornicate above and subtruncate, connivent, somewhat accrescent in fruit; stamens 4, the filaments subcompressed, slightly narrowed into the connective, equaling the sepals, the anthers short, the cells ovate or oblong-ovate, opening by a longitudinal slit; ovary ovoid, oblong, or obovoid, truncate at the apex or attenuate to the style, 2-celled; ovules 2 or 1 in each cell; style none or short, the stigma small, discoid, suborbicular or oblong, subbilobate; berries succulent and juicy at maturity, variously colored, 2-celled, the cells usually 1-seeded; seeds oblong, plane or convex, somewhat attenuate to the apex.

The largest genus of the family, with 500 or more species, all American. They are most numerous in the Andes of northern South America, but 70 or more have been recorded for Central America. The group is a well-marked one, and most of the Central American species can be referred at a glance to it, especially because of the narrow, spreading spathe, and the uniform spadices with only perfect flowers. Many of them are handsome plants, and some are cultivated for ornament locally or even in North America and Europe.

The genus as represented in Panama is a somewhat difficult one, chiefly on account of the large number of species and the quite inadequate material by which they are represented in herbaria. The following treatment is by no means satisfactory, but it is probably the best that can be prepared with the collections now at hand for study. Some of the species recognized are probably not valid, and there are perhaps others represented by imperfect specimens examined.

a. Leaves pedately parted or deeply trilobate.
  b. Leaves merely deeply trilobate ..... 3. A. GARAGARANUM
  bb. Leaves pedately parted. Large, epiphytic vines.
    c. Leaf segments entire ..... 1. A. AEMULUM
    cc. Leaf segments lobate or undulate ..... 2. A. HOLTONIANUM
aa. Leaves entire, but often cordate or hastate at the base and with basal or posterior lobes.
  b. Leaf blades deeply cordate or hastate at the base, with large and well-developed posterior lobes, much the broadest at or near the base.
    c. Blades conspicuously triangular in outline, the lateral margins shallowly or deeply constricted above the basal lobes.
      d. Spadix borne on a stipe 5–15 mm. long ..... 4. A. OCHRANTHUM
      dd. Spadix sessile or nearly so.

e. Leaves coriaceous, the nerves stout and very conspicuous ..... 5. A. DENUDATUM
ee. Leaves membranaceous (when dried), the nerves slender and not markedly conspicuous ..... 6. A. TRIANGULUM
cc. Blades ovate or rounded-ovate, the lateral margins convex, nowhere constricted.
d. Basal sinus of the blade shallow, much broader than long; blades very thin, the lateral nerves united to form a slender but very distinct collective nerve close to the margin.
e. Spadix about 9 cm. long; blades almost 30 cm. long ..... 7. A. WILLIAMSII
ee. Spadix about 3.5 cm. long; blades 18 cm. long or less ..... 8. A. DAVIDSONIAE
dd. Basal sinus of the blade deep, much longer than broad.
e. Spathe large, commonly 16 cm. long, the spadix of about equal length ..... 9. A. CONCINNATUM
ee. Spathe smaller, 12 cm. or less.
f. Costa of the leaf emitting 5 or fewer lateral nerves on each side above the basal nerves; peduncles shorter than the petioles ..... 10. A. HOFFMANNII
ff. Costa of the leaf emitting 7 or more lateral nerves on each side above the basal nerves; peduncles about equaling the petioles ..... 11. A. BAILEYI
bb. Leaf blades attenuate to rounded at the base, rarely subcordate or emarginate, but then without well-developed basal lobes and not conspicuously broadened near the base.
c. Leaves not 3-nerved, the primary lateral nerves extending almost or quite to the margin, or at least not united to form a definite collective nerve.
d. Leaves long-petiolate, the blades truncate or shallowly and openly cordate at the base ..... 12. A. COLONICUM
dd. Leaves short-petiolate, the blades gradually narrowed to the cuneate or attenuate base.
e. Uppermost portion of the petiole, above the node, not carinate dorsally.
f. Upper node of the petiole about as broad as long ..... 13. A. TETRAGONUM
ff. Upper node of the petiole conspicuously longer than broad.
g. Spathe 10–25 cm. long or more ..... 14. A. SCHLECHTENDALII
gg. Spathe 6–7 cm. long ..... 15. A. FATOENSE
ee. Uppermost portion of the petiole, above the node, conspicuously 1- to 5-carinate dorsally.
f. Blades chiefly 10–15 cm. wide ..... 16. A. AGNATUM
ff. Blades commonly 25–30 cm. wide or larger.
g. Upper node of the petiole 3-carinate ..... 17. A. CRASSINERVIUM
gg. Upper node of the petiole 5-carinate ..... 18. A. MAXIMUM
cc. Leaves evidently 3-nerved, the primary lateral nerves united to form a definite collective nerve close to the margin of the blade.
d. Plants normally with well-developed, long caudices having elongate internodes.
e. Leaf blades acute at the base, coriaceous, 16 cm. long or less.
f. Spadix slender-stipitate; petioles more than half as long as the blades ..... 19. A. PITTIERI
ff. Spadix sessile; petioles mostly less than half as long as the blades.
g. Peduncles 2–3 times as long as the petioles ..... 20. A. TRINERVE
gg. Peduncles equaling or slightly exceeding the petioles ..... 21. A. SCANDENS
ee. Leaf blades very obtuse, rounded or even subcordate or emarginate at the base.
f. Blades with 2 of the lower lateral nerves much more conspicuous than the others and extending to the apex; spadix conspicuously attenuate upward ..... 22. A. MYOSUROIDES
ff. Blades with all the primary lateral nerves subequal, none of them extending to the apex; spadix very obtuse, not attenuate upward.
g. Leaf blades subcordate at the base ..... 23. A. GRACILENS
gg. Leaf blades rounded at the base.
h. Spadix almost sessile ..... 24. A. MICROSPADIX

hh. Spadix conspicuously stipitate ..... 25. A. PALLENS
dd. Plants acaulescent or nearly so, the caudex very short, never with elongate internodes.
e. Leaf blades truncate or even subcordate at the base ..... 26. A. TALAMANCAE
ee. Leaf blades long-attenuate to obtuse at the base.
f. Blades conspicuously broadest above the middle, oblanceolate to obovate, long-attenuate to the base.
g. Leaves thin and almost membranaceous when dried, narrowly long-attenuate at the apex, 6.5 cm. wide or less, the very slender submarginal nerve irregular and more or less crenate.
h. Leaf blades less than 5 cm. wide; petiole geniculate near the apex ..... 27. A. SCOLOPENDRINUM
hh. Leaf blades more than 5 cm. wide; petiole geniculate 1 cm. below the apex ..... 28. A. MICHELII
gg. Leaves coriaceous when dried, short-acuminate or abruptly cuspidate-apiculate, 9–20 cm. wide or more, the stout marginal nerve even.
h. Node of the petiole 5 mm. thick; blades about 9 cm. wide; spadix in anthesis scarcely 4 mm. thick ..... 29. A. RAMONENSE
hh. Node of the petiole 1 cm. thick or more; blades mostly about 20 cm. wide; spadix in anthesis 1 cm. thick or more ..... 30. A. HACUMENSE
ff. Blades broadest at or below the middle, not very long-attenuate to the base.
g. Leaves linear or essentially so, less than 3.5 cm. wide, thick-coriaceous ..... 31. A. GRACILE
gg. Leaves usually conspicuously broader than linear, if almost linear, then not thick-coriaceous, generally much more than 3.5 cm. wide.
h. Blades oblong to elliptic-oblong or narrowly elliptic, usually less than 4 times as long as wide, mostly 5–13 cm. wide.
i. Petioles much less than half as long as the blades; leaves coriaceous when dried ..... 32. A. LITTORALE
ii. Petioles about half as long as the blades; leaves relatively thin when dried and scarcely coriaceous ..... 33. A. ACUTANGULUM
hh. Blades narrowly oblong or linear-oblong, most of them 5 times as long as wide or longer, mostly 3.5–8 cm. wide, but sometimes somewhat wider.
i. Primary lateral nerves of the leaves stout and salient, much more conspicuous than the secondary ones ..... 34. A. JOSEANUM
ii. Primary lateral nerves very slender, scarcely if at all stouter or more prominent than the secondary ones.
j. Petioles less than half as long as the blades ..... 35. A. TURRIALBENSE
jj. Petioles almost equaling the blades.
k. Leaf blades not punctate ..... 36. A. CHIRIQUENSE
kk. Leaf blades conspicuously punctate on both surfaces ..... 37. A. ALLENII

1. ANTHURIUM AEMULUM Schott, Bonplandia 7:165. 1859.

A large, epiphytic vine, the caudex slender, with elongate nodes; cataphylls caducous; petioles slender, equaling or longer than the blades, geniculate near the apex; blades 7- to 11-parted, the segments sessile or petiolulate, 15–30 cm. long, mostly 5–7 cm. wide, oblong-elliptic or oblanceolate-oblong, thin when dried, cuspidate-acuminate, cuneately narrowed to the base, the lateral nerves united to form 2 collective nerves, one close to the margin, the other remote from it, all the nerves very slender; peduncles 5–15 cm. long, slender or stout; spathe 7–10 cm.

Fig. 74. *Anthurium aemulum*

long, 1–2.5 cm. wide at the base, lanceolate or linear-lanceolate, pale green; spadix short-stipitate or sessile, conoid or at first caudiform, somewhat attenuate upward, 3–10 cm. long, as much as 13 mm. thick.

Scandent on trees in wet forest, mostly at 250 meters or less, southern Mexico to Panama.

CANAL ZONE: Barro Colorado Island, *Shattuck 125*. COLÓN: Fató, *Pittier 3864*. PANAMÁ: Río Tapia, *Standley 28258*.

The plant is a rather handsome and decorative one, easily recognized by its leaf form. In two of the specimens cited the leaf segments are conspicuously stipitate, which would exclude them, according to Engler's key to species, from *A. aemulum*, but it appears questionable whether the attachment of the leaf segments, i. e., whether they are sessile or stipitate, is an important taxonomic character.

2. ANTHURIUM HOLTONIANUM Schott, Oesterr. Bot. Zeitschr. 8:350. 1858.

Usually a very large, scandent epiphyte, the caudex often thick; petioles slender or stout, as much as a meter long, geniculate near the apex, the terete node as broad as long; blades often very large, a meter or more in breadth, 5- to 9-cleft, the segments sessile or nearly so, attenuate at the base, shallowly or deeply lobate or merely undulate, thin when dried, the lateral lobes obtuse or rounded, the terminal lobe of each main segment acuminate; peduncles about 60 cm. long, sometimes shorter; spathes 30–65 cm. long, 3 cm. wide or more, wine-red or dull brick-red, linear-lanceolate, very long-acuminate; spadix caudiform, gray or dark red, 40–80 cm. long, about 2 cm. thick at the base, slightly attenuate upward.

Climbing over trees or rocks in humid forest, at or near sea level, Costa Rica to Colombia.

CANAL ZONE: Barro Colorado Island, *Kenoyer 178; Aviles 26; Woodworth & Vestal 554; Frost 198; Shattuck 289, 762; Standley 31452, 41078;* Las Cascadas Plantation, near Summit, *Standley 25708, 25722, 25732, 25750;* Fort Randolph, *Standley 28627;* Fort Sherman, *Standley 31155;* Gorgona, *Maxon 6788*. DARIÉN: Boca de Cupe, *Williams 961*. PANAMÁ: La Chorrera, *Paul 502*.

One of the commonest and most showy aroids of the Isthmus region, easy of recognition because of its pedately parted leaves with lobed segments. The earliest leaves of juvenile plants are simple, the next have two or three segments.

At this stage the segments are not at all lobed, and such juvenile plants can be mistaken easily for *P. aemulum*, but the venation is different in the two species.

3. ANTHURIUM GARAGARANUM Standl. Field Mus. Bot. Ser. 22:68. 1940.

A large, coarse plant, the caudex apparently short and thick; petioles stout, 40–60 cm. long, narrowly sulcate, subterete, geniculate about 1.5 cm. below the apex, the node 7–8 mm. thick; blades deeply 3-lobate to about 5 cm. above the subtruncate base, the lateral lobes incurved-falcate, 23–36 cm. long, 10–11 cm. wide, obtuse or subacute, rounded on the outer margin, almost straight on the inner margin, the costa dividing about 4 cm. above the base into 4 primary nerves, these stout and extending almost or quite to the apex of the segment, the middle segment 36 cm. long and 9 cm. wide or larger, narrowly long-acuminate, the costa very stout and prominent beneath, the primary costal nerves numerous, rather stout and prominent, divergent at an angle of 45 degrees or more, united to form a rather irregular collective nerve close to the margin; peduncle about 25 cm. long, terete, 5–7 mm. in diameter; spathe lance-linear, 17 cm. long, 1.5 cm. wide near the base; spadix slender, caudiform, sessile or nearly so, 17 cm. long, 9 mm. in diameter near the base, slightly attenuate upward.

Known only from the original Panama collection.

DARIÉN: foothills of Garagará, 30–500 m., *Pittier 5601* (TYPE).

The type material was determined by Krause as *Philodendron tripartitum* (Jacq.) Schott, a plant that it does not resemble closely in leaf form. It is clearly an *Anthurium*, and appears related to *A. tripartitum* Engler. This was described from Barbacoas, Colombia, and its description agrees well in some respects with the Panama plant, but certain characters of *A. tripartitum*, as that is described by Engler, make it plain that *A. garagaranum* must be considered distinct.

4. ANTHURIUM OCHRANTHUM C. Koch, Ind. Sem. Hort. Berol. App. 16. 1853. *Anthurium lapathifolium* Schott, Oesterr. Bot. Wochenbl. 7:309. 1857.

Caudex as much as 1 m. high; petioles 6–9 cm. long, geniculate 2 cm. below the apex, subterete; blade gradually narrowed above the basal lobes to the abruptly narrowed and cuspidate apex, 50 cm. long or more, the basal lobes 15 cm. long and 10 cm. wide, elongate-oblong, with almost equal sides, rounded, the basal sinus triangular or oval, open, the basal nerves 5–6 on each side, the costal nerves 7–9 on each side, united to form a collective nerve remote from the margin; peduncles 1 m. long or more; spathe 20 cm. long, lanceolate, long-acuminate, short-decurrent at the base, green or yellowish green; spadix borne on a stipe 5–15 mm. long, at first violet, later yellow, elongate-fusiform, 20 cm. long, 1 cm. thick; ovaries cylindroid, the style exserted above the sepals; berries ovoid, 1 cm. long, 5 mm. thick, whitish; seeds cordiform, the testa green, verruculose.

Costa Rica and Panama.

CANAL ZONE: Chagres, *Fendler 429* (TYPE of *A. lapathifolium*).

I have seen nothing to represent this species, but from description it must be fully distinct from any other species listed here.

5. ANTHURIUM DENUDATUM Engler, Bot. Jahrb. 6:280. 1885.

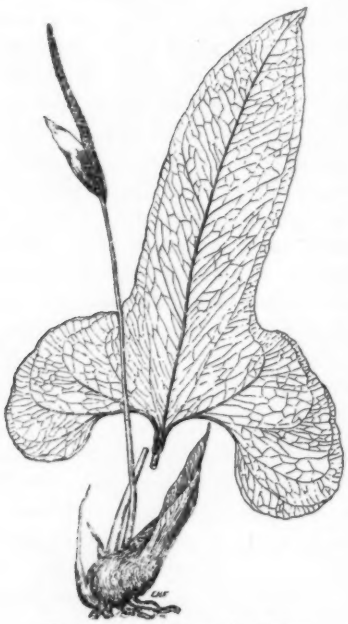

Fig. 75. *Anthurium denudatum*

Plants epiphytic, or sometimes, perhaps accidentally, terrestrial, often very large and coarse, the caudex said to be sometimes a meter long, the internodes short and thick; cataphylls persistent but weathering into long fibers; petioles mostly 60–70 cm. long, geniculate near the apex, the node short and thick; blades thick-coriaceous when dried, hastate-trilobate, 30–50 cm. long or larger, the basal lobes rather narrow and more or less spreading, subreniform, somewhat recurved, separated by a very broad but deep sinus, the anterior lobe lance-oblong or ovate-oblong, acute or acuminate, 8–15 cm. wide below, the primary nerves very stout and salient, the costal nerves united to form an irregular collective nerve remote from the margin; peduncles 20–50 cm. long or more, slender or stout; spathes 7–20 cm. long, as much as 2.5 cm. wide near the base, linear-lanceolate, cuspidate-acuminate, reddish brown or greenish; spadix short-stipitate or almost sessile, cylindric or caudiform, 14–35 cm. long, in fruit up to 2.5 cm. in diameter at the base; sepals almost 3 mm. long; ovaries ovoid, 2 mm. long, attenuate to a style 1 mm. long; berries orange, 7 mm. long or more.

Panama and Colombia, in the latter country reported to occur at an elevation of 1,800 meters.

CANAL ZONE: near Gatún, *Hayes;* Balboa, cultivated, *Standley 28559;* Río Indio de Gatún, *Pittier, 2779, 2799;* Barro Colorado Island, *Starry 232; Kenoyer 181; Woodworth & Vestal 567.* COCLÉ: north rim of El Valle, *Allen & Alston 1844.* PANAMÁ: Arenoso, lower Río Trinidad, *Seibert 598.*

Illustrated, Pflanzenreich IV. 23B: *fig. 71.* The species is a well-marked one, its leaf form quite distinctive and easy of recognition when once known.

6. ANTHURIUM TRIANGULUM Engler, Bot. Jahrb. 25:383. 1898.

Plants epiphytic or sometimes terrestrial, the caudex short or occasionally elongate, the internodes 1.5 cm. long or less; cataphylls lanceolate, 3–4 cm. long; petioles slender or stout, 30–45 cm. long or more, geniculate 1–2 cm. below the

apex; blades rather thin when dried, triangular-sagittate, mostly 30–40 cm. long and 15–25 cm. wide, the basal lobes separated by a broad, open, shallow or deep sinus, rather narrow or broadly rounded, often directed outward but more often downward, the anterior lobe acute to acuminate and long-cuspidate, the costal nerves 3–4 or more on each side, slender but very prominent, remote, united to form a distinct collective nerve near or remote from the margin; peduncles longer or shorter than the petioles, slender, mostly 25–35 cm. long; spathes linear-lanceolate or lance-oblong, 5–11 cm. long, 1–2.5 cm. wide; spadix gray-green, sessile or nearly so, 5–10 cm. long, stout, but slightly narrowed upward; ovary oblong, 3 mm. long, 1.5 mm. thick; berries 3.5 mm. long, 2.5 mm. thick, maroon.

Humid forest, at or near sea level, Panama and Costa Rica(?).

CANAL ZONE: Gamboa, *Standley 28398, 28399;* Frijoles, *Standley 27567;* Río Indio de Gatún, *Pittier 2795;* Barro Colorado Island, *Standley 31286, 41044, 41087; Kenoyer 190; Aviles 17.* BOCAS DEL TORO: Isla Colón, Chiriquí Lagoon, *Wedel 122;* Shepherd Island, Chiriquí Lagoon, *Wedel 2720* (TYPE from Shirores, Talamanca, Costa Rica, *Pittier & Tonduz 9225*).

7. ANTHURIUM WILLIAMSII Krause, Notizbl. Bot. Gart. Berlin 11:610. 1932.

Plants apparently epiphytic, the stout caudex 1.5 cm. thick, the internodes short; cataphylls linear-lanceolate, acute, about 8 cm. long, soon weathering into fibers; petioles very slender, 50–60 cm. long, geniculate 1 cm. below the apex, the node relatively slender; blades thin and membranaceous when dried, broadly ovate in outline, acute or short-acuminate, cordate at the base and somewhat unequal, the basal sinus broadly triangular and open, sometimes 5 cm. deep, the basal lobes broadly rounded, directed downward, the blade about 28 cm. long and 20 cm. wide, the primary lateral nerves 14–16 on each side, very slender, prominulous on both sides, ascending at a wide angle, united to form a slender collective nerve 3–5 mm. from the margin; peduncles slender, terete, 20 cm. long; spathe green, oblong-lanceolate, acuminate, 4 cm. long, 1 cm. wide; spadix subsessile, dark red, narrowly cylindric, obtuse, caudiform, 9 cm. long, 4–5 mm. thick; sepals oblong, 1.5 mm. long; pistils ovoid.

Known only from the original collection, from Panama.

DARIÉN: Cana, 600–1950 m., *Williams 817* (TYPE).

8. ANTHURIUM DAVIDSONIAE Standl. Field Mus. Bot. Ser. 22:4. 1940.

Plants said to be terrestrial, but appearing to be essentially epiphytic, the caudex slender and elongate, about 6 mm. thick, with short internodes; cataphylls linear-attenuate, as much as 12 cm. long, the nodes emitting numerous long roots; petioles very slender, 12–19 cm. long, geniculate about 1 cm. below the apex, the node very slender; blades ovate-oval or broadly oval, membranaceous when dried, 15–18 cm. long, 9.5–11 cm. wide, obtuse at the apex and abruptly caudate-acuminate, with an acumen 2 cm. long or more, broadly and shallowly cordate at the base, the basal lobes broadly rounded, the basal sinus much broader than deep, slightly paler beneath, 9-nerved at the base, the primary costal nerves about 12

Fig. 76. *Anthurium Davidsoniae*

on each side, ascending at an angle of about 45 degrees, very slender, united to form a distinct collective nerve remote from the margin; peduncles slender, 9–11 cm. long; spathe pale green, narrowly oblong, 3 cm. long and 5 mm. wide, long-acuminate; spadix pale yellow, sessile, obtuse, 2.5–3.5 cm. long, 3–4 mm. thick, slightly attenuate upward.

Known only from Chiriquí, Panama.

CHIRIQUÍ: in rain forest, Bajo Chorro, Boquete District, 1800 m., *Davidson 134* (TYPE); vicinity of Bajo Chorro, 1900 m., *Woodson & Schery 691*.

9. ANTHURIUM CONCINNATUM Schott, Prodr. Aroid. 522. 1860.

Anthurium bogotense Schott var. *concinnatum* Engler in DC. Monogr. Phan. 2:184. 1879.

Plants usually epiphytic but reported to be sometimes terrestrial, the caudex short or elongate, as much as 2 cm. thick, the internodes usually short; cataphylls narrowly oblong, often persistent and rather thick; petioles slender, mostly 40–60 cm. long, geniculate about 2 cm. below the apex; blades subcoriaceous when dried, broadly ovate-cordate or deltoid-cordate, mostly 40–50 cm. long and almost as wide, cuspidate-acuminate, the basal lobes one-third as long as the posterior one or shorter, broadly rounded, separated by a deep and rather narrow but open sinus, directed downward or somewhat incurved, the primary costal nerves 5 or more on each side, stout and very prominent, united to form a prominent collective nerve close to the margin; peduncles 50 cm. long or more; spathe lanceolate, 15–18 cm. long, 3–4 cm. wide near the base, acuminate; spadix subsessile or on a stipe 1 cm. long, often 18 cm. or more in length, dark red at first, 1 cm. thick below, somewhat attenuate upward; sepals linear; ovaries oblong, gradually attenuate to a thick, conoid style.

Humid forest, Panama and Costa Rica, and probably extending to Honduras or even farther northward.

CHIRIQUÍ: Bajo Chorro, Boquete District, 1800 m., *Davidson 284, 405;* trail from Cerro Punta to headwaters of Río Caldera, 2250–2500 m., *Allen 1453;* Potrero Muleto to summit, Volcán de Chiriquí, 3500–4000 m., *Woodson & Schery 382.* BOCAS DEL TORO: reported from Shirores, Talamanca, 100 m., *Pittier & Tonduz 9230.* COCLÉ: north rim of El Valle de Antón, near Cerro Turega, 700 m., *Woodson & Schery 194.*

10. ANTHURIUM HOFFMANNII Schott, Oesterr. Bot. Zeitschr. 8:181. 1858.
Anthurium tsakianum Engler, Bot. Jahrb. 25:423. 1898.

Fig. 77. *Anthurium Hoffmannii*

Plants epiphytic or terrestrial on rocky banks, the caudex often assurgent and 30 cm. long or more, as much as 2 cm. thick, with short internodes; cataphylls 10–16 cm. long, linear-oblong, persistent and rather coriaceous, brown when dried; petioles slender or stout, 40–60 cm. long, geniculate 2–3 cm. below the apex; blades subcoriaceous when dried, broadly ovate-cordate, mostly 25–35 cm. long and 20–25 cm. wide, shortly cuspidate-acuminate, the posterior lobes broadly rounded, directed downward or slightly inward, the sinus open but usually narrow, the primary costal nerves 3–4 on each side or rarely more, rather stout and prominent beneath, united to form a distinct collective nerve rather remote from the margin; peduncles 15–30 cm. long; spathes lanceolate, commonly 8–10 cm. long and 2–3 cm. wide, long-acuminate or caudate-acuminate, whitish or greenish; spadix sessile or short-stipitate, cylindric, obtuse, dark red, 6–12 cm. long, almost 1 cm. thick at the base or in fruit 1.5 cm.; fruits red.

Usually on trees, sometimes on rocky banks, humid forest, mostly at 250–3000 m., Panama and Costa Rica.

CHIRIQUÍ: Bajo Mono, Boquete District, *Davidson 461;* Finca Lérida to Boquete, *Woodson, Allen & Seibert 1170;* near El Boquete, *Pittier 2872, 2965;* Volcán de Chiriquí, 3000 m., *Davidson 986.* COCLÉ: north rim of El Valle, *Allen & Alston 1845;* floor of El Valle, *Allen 2230.* BOCAS DEL TORO: Tsaki, Talamanca, *Tonduz 9510* (TYPE of *A. tsakianum*); seven miles north of Bocas del Toro, *Wedel 344.*

11. ANTHURIUM BAILEYI Standl. Field Mus. Bot. Ser. 22:66. 1940.

Plants rather large and coarse, terrestrial, the caudex very short or almost none, about 1.5 cm. thick, with very short internodes; cataphylls short, more or less withering-persistent; petioles 50–60 cm. long, rather slender, 7 mm. thick near the base, terete, brownish when dried; blades deltoid-ovate-cordate, thin and almost membranaceous when dried, about 44 cm. long and 32 cm. wide, abruptly short-acuminate, green above and usually densely black-punctate, somewhat paler beneath, the basal lobes large, rounded or somewhat obtuse-angulate on the outer

margin, making the blade slightly hastate, the sinus broad, open, triangular, 12 cm. deep, the primary costal nerves about 7 on each side, united to form a slender, irregular collective nerve close to the margin, the basal nerves 5; peduncles about 45 cm. long, slender, terete, brownish; spathe apparently green, 12.5 cm. long, 1.5 cm. wide at the base, linear-lanceolate, very long-attenuate, slightly shorter than the spadix; spadix borne on a stipe 1.5 cm. long or more, 12 cm. long, 7–8 mm. thick at the base, slightly attenuate upward, obtuse.

Known only from Panama, in humid forest near sea level.

CANAL ZONE: Barro Colorado Island, *L. H. & E. Z. Bailey 196* (TYPE); *Standley 31294, 41104;* hills north of Frijoles, *Standley 27440.* PANAMÁ: Río Tapia, *Standley 26159;* Río Tecumen, *Standley 26739.* SAN BLAS: Puerto Obaldía, *Pittier 4277.*

Pittier 4277 was determined by Krause as *A. nitidum* Benth., apparently in error. There is some doubt as to whether all the specimens cited represent a single species. In the type specimen, the only one bearing an inflorescence, the petioles are smooth and the blades are glabrous. In several of the other specimens the petioles are aculeolate, and the blades are conspicuously puberulent beneath, at least along the nerves. The plants are common on Barro Colorado Island, and all the leaf specimens probably are conspecific, although it is quite possible that more ample material will show that two distinct species, or even genera, are represented.

12. ANTHURIUM COLONICUM Krause, Bot. Jahrb. 54, Beibl. 118:123. 1916.

Plants large and coarse, epiphytic, the caudex apparently short, very thick, with short internodes; petioles half to three-fourths as long as the blades, stout, terete, 40–60 cm. long, 15–18 mm. thick near the base, geniculate 3–3.5 cm. below the apex; blades coriaceous when dried, oblong, 60–80 cm. long, 15–20 cm. wide, somewhat narrowed near the apex and cuspidate-acuminate, truncate or shallowly cordate at the base, with broad, rounded basal lobes, the costa stout and prominent beneath, the primary costal nerves 12–16 on each side, stout and prominent, irregularly anastomosing near the margin but not forming a distinct collective nerve; peduncles rather stout, terete, about 30 cm. long and 8–10 mm. thick; spathe lanceolate, long-acuminate, slightly decurrent upon the peduncle, 10 cm. long and 3 cm. wide; spadix borne on a stipe almost 2 cm. long, narrow-cylindric, slightly attenuate upward, obtuse, 15 cm. long, 1.5 cm. thick at the base; sepals 1.5–1.8 mm. long; pistils ovoid.

Known only from the original Panama collection.

COLÓN: forests about Porto Bello, near sea level, *Maxon 5801* (TYPE).

13. ANTHURIUM TETRAGONUM Hook. ex Schott, Prodr. Aroid. 475. 1860.

Plants large and coarse, epiphytic, the short caudex 6–8 cm. thick, with very short internodes; petioles scarcely one-sixth as long as the blades, 10–20 cm. long or shorter, broadly canaliculate above, the short node cubical; blades coriaceous when dried, broadly obovate to oblanceolate, 60–130 cm. long and 25–50 cm. wide when well developed, rounded and short-cuspidate at the apex, cuneately narrowed to the base, the costa very thick and subpentagonal, 1–2 cm. thick at

the base, the primary lateral nerves 15–20 on each side, erect-spreading, not united to form a distinct collective nerve, stout and prominent; peduncles terete, one-third as long as the blades or shorter, mostly 20–30 cm. long; spathe oblong-lanceolate, long-cuspidate, obliquely decurrent at the base, 15–20 cm. long, 3–4 cm. wide near the base; spadix short-stipitate, 2–3 cm. thick at the base, caudate-attenuate upward, dull green, 15–25 cm. long; sepals 3 mm. long and one-third as wide; stamens equaling the sepals; ovary subfusiform, half longer than the sepals, attenuate to the apex; berries elongate-turbinate, purplish below, yellowish green toward the apex, 1–1.5 cm. long, 2–3 mm. thick, 1- to 3-seeded; seed oblong, one-third as long as the berry.

Lowland forests of Costa Rica and Panama, and perhaps more widely distributed.

CHIRIQUÍ: David, *Pittier 2844* (determined by Krause). BOCAS DEL TORO: Shirores, Talamanca, *Tonduz 9228, 9234;* Tsaki, *Tonduz 9507* (reported by Engler).

14. ANTHURIUM SCHLECHTENDALII Kunth, Enum. Pl. 3:75. 1841.

Plants epiphytic or terrestrial, often growing on rocks, rather large and coarse, acaulescent; petioles subtetragonous, less than one-fourth as long as the blade, usually very short, sometimes as much as 15 cm. long and 1–1.5 cm. thick, with a very short node; blades obovate-oblong or oblanceolate-oblong, commonly 50–60 cm. long and 15–20 cm. wide, often larger, acute or acuminate, coriaceous when dried, gradually narrowed from about the middle to the narrow, cuneate base, the costa stout and prominent, 1 cm. thick at the base, the primary lateral nerves about 14 on each side, stout and prominent, not forming a distinct collective nerve, ascending at an angle of 45 degrees; peduncles shorter than the leaves, often very short, sometimes 60 cm. long, stout or slender; spathe reflexed, 10–25 cm. long or more, 2 cm. wide near the base, pale green or sometimes tinged with red or purple, long-attenuate, more or less decurrent at the base upon the peduncle; spadix 15–25 cm. long, often 1 cm. or more in diameter at the base, attenuate upward, reddish or greenish, in fruit 2 cm. thick.

Humid forest, or sometimes in exposed situations, usually at or near sea level, but in Mexico ascending to 1,000 meters, Panama to Mexico.

CANAL ZONE: Obispo, *Standley 31719;* Barro Colorado Island, *Shattuck 638; Standley 31343;* near Gatún, *Standley 27210;* Culebra, *Pittier 2698;* Balboa, cultivated, *Standley 28578.*

It may be remarked here that the species of this alliance, nos. 13 to 18, inclusive, are very much confused, at least in the mind of the writer, and probably not less so by Engler and Krause. Much more material is needed before their proper disposition can be determined satisfactorily. The writer is not at all satisfied with the arrangement of the species made here, and it is probable that errors have been made both in determination and division of the available collections. I have depended largely upon determinations by Krause of plants collected by Pittier during the Smithsonian Biological survey of the Canal Zone, but I do not believe that even those are too dependable.

15. ANTHURIUM FATOENSE Krause, Notizbl. Bot. Gart. Berlin 11:611. 1932.

Said to be terrestrial, but probably an essentially epiphytic plant, the caudex terete, short, 1.5 cm. thick, the internodes very short; cataphylls linear, long-attenuate, soon deciduous; petioles stout, 4–7 cm. long, 6–7 mm. thick, canaliculate for their whole length, the node very short, scarcely thickened; blades thin and almost membranaceous when dried, obovate-oblong, 50–65 cm. long, 13–16 cm. wide, long-acuminate, gradually narrowed from above the middle to the attenuate base, the costa rather stout and very prominent, the primary lateral nerves numerous, slender, prominent on both surfaces, arcuately ascending at a rather wide angle, not united to form a distinct collective nerve; peduncles slender, terete, 40–45 cm. long, 4–5 mm. thick; spathe linear-lanceolate, acuminate, 6–7 cm. long, 7 mm. wide; spadix subsessile, narrowly cylindric and caudiform, rounded at the apex, 12–14 cm. long, 6–8 mm. thick near the base; sepals oblong, 2 mm. long, 1.2 mm. wide; pistils ovoid; berries oblong-ovoid, attenuate upward, 4–5 mm. long, 2 mm. thick.

Known only from the original Panama collection.

COLÓN: Dos Bocas, Río Fató Valley, 40–80 m., *Pittier 4227* (TYPE).

16. ANTHURIUM AGNATUM Schott, Oesterr. Bot. Zeitschr. 8:181. 1858.

Plants epiphytic, large and coarse, acaulescent or nearly so, the caudex short and very thick; petioles one-fourth as long as the blades or shorter, mostly 10–15 cm. long but often shorter, with a short, oblong node; blades coriaceous when dried, oblong-oblanceolate or oblanceolate, 30–50 cm. long and 10–13 cm. wide or sometimes larger, acute or acuminate, gradually long-attenuate from above the middle to the long and narrow, often almost stipe-like base, the costa stout and prominent, the primary lateral nerves few, rather slender, prominent on both surfaces, arcuately ascending at an angle of about 45 degrees, not united to form a distinct collective nerve; inflorescences still imperfectly known.

On trees in humid forest, Panama and Nicaragua.

CANAL ZONE: between Gorgona and Gatún, *Pittier 2278* (determined by Engler); Balboa, cultivated, *Standley 28564*; Fort Sherman, *Standley 31018*. CHIRIQUÍ: Bajo Chorro, Boquete District, *Davidson 276* (determination doubtful).

This species is perhaps too close to *A. Schlechtendalii*.

17. ANTHURIUM CRASSINERVIUM (Jacq.) Schott, Melet. 1:22. 1832.
Pothos crassinervia Jacq. Icon. 3: *pl. 609*. 1793.

Plants normally epiphytic, very large and coarse, the caudex thick and short; petioles usually very short and thick, 3-carinate dorsally, 15–30 cm. long or often shorter, 2–3 cm. in diameter, the node 1.5–2 cm. long, tricarinate dorsally; blades coriaceous when dried, oblong-oblanceolate to obovate, usually 60–100 cm. long and 25–30 cm. wide but often much wider and longer, cuspidate-acute, cuneately long-attenuate to the narrow base, green above, slightly paler beneath, the costa very thick, 3- to 5-angulate, the primary lateral nerves 9–14 on each side, stout, prominent, spreading or erect-patent, not forming a distinct collective nerve;

peduncles shorter than the leaves, as much as 70 cm. long, about 1 cm. thick, angulate below, terete above; spathe subcoriaceous, dark red within, linear-lanceolate, long-acuminate, 12.5 cm. long or even longer, 2.5 cm. wide at the base; spadix short-stipitate, purple when young, later becoming white, caudiform, 15–30 cm. long and 1.5 cm. thick, or in fruit much larger or at least thicker, often 5 cm. or more in diameter, attenuate toward the apex; ovary ovoid, equaling the sepals; berries ovoid, bright red, 1 cm. long, 5 mm. thick; seeds ovoid, 4 mm. long, the testa yellow, minutely verruculose.

On trees in humid forest, or sometimes in rather exposed and dry places, generally distributed in Central America, and ranging from Colombia to Tobago and Venezuela, at or near sea level.

CANAL ZONE: Barro Colorado Island, *Bailey 72;* Fort Randolph, *Standley 28723;* Río Indio de Gatún, *Pittier 2801.* PANAMÁ: Alhajuela, *Pittier 2344.* BOCAS DEL TORO: Bocas del Toro, *Carleton 377;* Shepherd Island, Chiriquí Lagoon, *Wedel 2721.*

This is an abundant plant in many parts of the Panama lowlands as well as generally along the Atlantic coast of Central America. The plants often attain a huge size, and have a great number of densely clustered leaves, below which hang, on pendent peduncles, the heavy fruiting spadices whose bright coloring is certain to attract attention. Illustrated, Pflanzenreich IV. 23B: *fig. 24.*

18. ANTHURIUM MAXIMUM (Desf.) Engler, Pflanzenreich IV. 23B:77. 1905. *Pothos maxima* Desf. Cat. 8. 1829.

Plants epiphytic, very large and coarse, acaulescent or nearly so, with a dense cluster of large leaves; petioles much shorter than the blades (in specimens seen about 16 cm. long), 5-carinate dorsally, with a short and very thick node, 1.5–2 cm. thick; blades coriaceous when dried, obovate or obovate-oblong, about 50 cm. wide, cuspidulate, gradually cuneate-attenuate to the narrow base, the costa very thick and salient, carinate, the primary lateral nerves 14–16 on each side, thick, remote, very prominent, not united to form a distinct collective nerve; peduncles about 60 cm. long, 5- to 7-angulate, very stout, terete near the apex; spathe linear-lanceolate, short-decurrent at the base, about 45 cm. long and 2 cm. wide; spadix sessile, caudiform, 50–60 cm. long, dull green; berries bright red, pyriform, 1 cm. long, 4–5 mm. thick at the apex; seeds oblong, somewhat compressed, 5 mm. long, the testa yellow, very minutely verruculose.

On trees in humid forest, Panama and Colombia; in Colombia occurring at 1,400 meters.

CANAL ZONE: Frijoles, *Pittier 2679.*

The single Panama collection was determined by Krause. The leaves are larger than those of any other Panama species having entire leaf blades.

19. ANTHURIUM PITTIERI Engler, Bot. Jahrb. 25:373. 1898.

Plants small, epiphytic, the caudex elongate, sometimes 1 cm. thick but usually much more slender, the internodes mostly elongate; cataphylls deciduous, obtuse, 4–5 cm. long, 5–6 mm. wide; petioles slender, short-vaginate, 5–9 cm. long,

geniculate about 1 cm. below the apex, the node slender; blades coriaceous when dried, thick and succulent in the living state, oblong-lanceolate, 5–12.5 cm. long, 2.5–4 cm. wide, rather abruptly caudate-attenuate, acute at the base, the primary lateral nerves 7–9 on each side, very slender and inconspicuous, erect-patent, united to form an inconspicuous, slender collective nerve near the margin; peduncles slender, twice as long as the petioles or shorter, up to 15 cm. long, the stipitiform portion 1.5–3 cm. long; spathe linear-lanceolate, acuminate, long-decurrent on the peduncle, 7–8 cm. long or shorter, 1 cm. wide, pale green; spadix at anthesis 4–5 cm. long, in fruit 8 cm. long, 3–4 mm. thick, obtuse; sepals 2.5 mm. long, 4 mm. wide, dull purplish; ovary ovoid, 2 mm. long, the stigma subsessile; berries short-ovoid, pale green, 1- or 2-seeded, 3 mm. long and thick; seeds oblong, 1.5 mm. long.

On trees in humid forest, Panama and Costa Rica, at 600 to 3,000 meters.

CHIRIQUÍ: Los Siguas Camp, southern slope of Cerro de la Horqueta, 1700 m., *Pittier 5736*. DARIÉN: Cana-Cuasi trail, 600 m., *M. E. & R. A. Terry 1442*.

Illustrated, Pflanzenreich IV. 23B: *fig. 26*. The leaves usually are fuscous when dried.

20. ANTHURIUM TRINERVE Miq. Linnaea 17:67. 1843.

Anthurium trinerve Miq. var. *obtusum* Engler, Bot. Jahrb. 25:357. 1898.

Fig. 78. *Anthurium trinerve*

Plants epiphytic, the caudices elongate, emitting many long roots, covered by the fibrous remains of the cataphylls, the internodes short or elongate; petioles slender, one-third to two-thirds as long as the blade, semiterete, geniculate; blades subcoriaceous when dried, lanceolate or oblong-lanceolate, 5.5–11.5 cm. long, 1.5–4.5 cm. wide, long-acuminate to acute, acute at the base, densely punctate beneath, the primary lateral nerves very slender and inconspicuous, united to form a distinct collective nerve remote from the margin; peduncles very slender, 2–3 times as long as the petioles; spathe ovate-lanceolate, 1–1.5 cm. long, or sometimes 2.5 cm. long and 1 cm. wide, pale yellowish green, acuminate; spadix cylindric, obtuse, about 2 cm. long or in fruit 2.5–3.5 cm., bluish green or purple at first; berries white.

Humid forest, on trees or sometimes on rocks, Costa Rica to British Guiana and Amazonian Brazil.

BOCAS DEL TORO: Río Cricamola, between Finca St. Louis and Konkintoë, 10–50 m., *Woodson, Allen & Seibert 1880;* Old Bank Island, Chiriquí Lagoon, *Wedel 2046, 2171;* Chiriquí Lagoon, *Wedel 1149.* CHIRIQUÍ: Cerro de Lino, above El Boquete, 1300–1560 m., *Pittier 3028;* Bajo Chorro, Boquete District, 1800 m., *Davidson 162;* vicinity of Bajo Mona and Quebrada Chiquero, 1500 m., *Woodson & Schery 570.*

It seems probable that this should be reduced to synonymy under *A. scandens*, or at most constitute a variety of that species. Peduncle length alone hardly can be considered a character of specific importance, when one considers the amount of individual variation found in other species of the genus.

21. ANTHURIUM SCANDENS (Aubl.) Engler in Mart. Fl. Bras. 3^2:78. 1878.

Dracontium scandens Aubl. Pl. Guian. 2:836. 1775.
Anthurium rigidulum Schott, Oesterr. Bot. Zeitschr. 8:180. 1858.

Fig. 79. *Anthurium scandens*

Plants epiphytic, the caudices elongate, often branched, becoming suffrutescent, rather stiff, usually emitting many long roots from the nodes, the internodes short or elongate, usually covered by fibrous remains of the cataphylls; petioles slender or rather stout, one-fifth to one-half as long as the blades, dilated at the base, geniculate near the apex and slightly dilated; blades subcoriaceous when dried, densely punctate beneath, lanceolate to oblong-lanceolate or sometimes lance-ovate, mostly 4.5–9 cm. long and 2–4 cm. wide, acuminate to subobtuse, acute at the base or rarely obtuse or rounded, the primary lateral nerves numerous, very slender, prominent beneath but not conspicuous, united to form a distinct but slender collective nerve near the margin; peduncles slender, equaling or slightly exceeding the petioles; spathe green or pale green, lanceolate or oblong-lanceolate, usually 2.5 cm. long or less, cuspidate, reflexed; spadix sessile or nearly so, in anthesis about 2 cm. long, very obtuse, in fruit often 4.5 cm. long; berries globose, usually lavender or pale purple, sometimes white, about 5 mm. in diameter.

On trees or rocks in humid forest, rarely in exposed and rather dry situations, southern Mexico to the Guianas and southern Brazil, ranging from sea-level up to 2,100 meters or more.

CANAL ZONE: Bohío, *Pittier 3424;* Barro Colorado Island, *Shattuck 1028; Kenoyer 194;* lake shore along Gatún River valley, *Pittier 6515.* BOCAS DEL TORO: Western River, *Wedel 20;* Water Valley, Chiriquí Lagoon, *Wedel 1558;* Isla Colón, Chiriquí Lagoon, *Wedel 1290;* Fish Creek, Chiriquí Lagoon, *Wedel 2390;* Nievecita, *Woodson, Allen & Seibert 1873.* CHIRIQUÍ: between Alto de las Palmas and top of Cerro de la Horqueta, 2100 m., *Pittier 3259;* Casita Alta, Volcán de Chiriquí, 1500–2000 m., *Woodson, Allen*

& *Seibert 925;* Volcán de Chiriquí, 2100 m., *Davidson 913;* Boquete, *Davidson 734.* COCLÉ: north rim, El Valle, *Allen 1812.*

Although a relatively small and inconspicuous plant as compared with most epiphytic Araceae, this is perhaps the most abundant and widely distributed member of the family in Central America. It is easy of recognition because of its small, 3-nerved leaves, pointed at each end. The usually lavender berries are rather handsome. Illustrated, Pflanzenreich IV. 23B: *fig. 21;* HBK. Nov. Gen. & Sp. 1: *pl. 19;* Hook. Exot. Fl. *pl. 55;* Lodd. Bot. Cab. *pl. 632;* Saunders, Refug. Bot. *pl. 257.*

22. ANTHURIUM MYOSUROIDES (HBK.) Endl. Gen. 240. 1837.

Pothos myosuroides HBK. Nov. Gen. & Sp. 1:62, *pl. 18.* 1815.
Anthurium myosuroides (HBK.) Endl. var. *angustifolium* Engler, Bot. Jahrb. 25:382. 1898.

Plants epiphytic, the caudices elongate and creeping or scandent, less than 3 mm. in diameter, green, rooting at the nodes, the internodes mostly elongate; cataphylls short, linear-attenuate, caducous; petioles slender, sometimes almost equaling the blades but usually much shorter, 15 cm. long or less, geniculate 1–2.5 cm. below the apex, the node slender; blades membranaceous and usually bright green when dried, slightly paler beneath, epunctate, ovate-elliptic to ovate-oblong or oblanceolate-oblong, mostly 13–20 cm. long and 4–9 cm. wide, cuspidate-acuminate to attenuate, somewhat narrowed to the obtuse or narrowly rounded and shallowly cordate base, the basal lobes small and broadly rounded, separated by an open sinus, quintuplinerved at the base, the upper 2 nerves arising far above the base, the primary lateral nerves 9–10 on each side, very slender, united to form a slender collective nerve remote from the margin; peduncles very slender, 7–14 cm. long; spathe lanceolate, acuminate or long-attenuate, 5–7 cm. long, 14 mm. wide or less, pale green; spadix borne on a stipe 5–10 mm. long, or sometimes almost sessile, slender and attenuate upward, 5–8 cm. long or in fruit as much as 12 cm., 3–4 mm. thick in anthesis; berries ovoid, 8 mm. long, orange or scarlet.

On trees in humid forest, Guatemala to Colombia, in Central America usually at low elevations, in Colombia ascending to 2,000 meters; probably also in southern Mexico.

CANAL ZONE: Barro Colorado Island, *L. H. & E. Z. Bailey 517, 625; Starry 60.* COCLÉ: El Valle, 600–1000 m., *Allen 1186.* DARIÉN: between Pinogana and Yavisa, *Allen 290;* Boca de Pauarandó, Sambú River, *Pittier 5574.*

Pittier 5574 was determined by Krause as *A. mexicanum* Engler (this name is invalidated by *A. mexicanum* Liebm., 1849–50), which may be synonymous with *A. myosuroides.* Var. *angustifolium,* described from Matina, Costa Rica, has leaf blades only 3 cm. wide.

23. ANTHURIUM GRACILENS Standl. Field Mus. Bot. Ser. 22:68. 1940.

Plants epiphytic or sometimes terrestrial, the caudex elongate, slender, 4 mm. in diameter, brownish, with elongate internodes; cataphylls linear-attenuate,

brown, deciduous; petioles very slender, slightly shorter than the blades, 10–22 cm. long, geniculate 1–1.5 cm. below the apex, the node slender; blades membranaceous and usually bright green when dried, only slightly paler beneath, epunctate, ovate-elliptic to ovate-oblong, 17–21 cm. long, 6.5–8 cm. wide, cuspidate-acuminate, scarcely at all narrowed toward the base, this broadly rounded and emarginate or subcordate, rarely truncate, 5-nerved at the base, the primary lateral nerves about 9 on each side, ascending at an angle of 45 degrees or usually more, very slender, united near the margin to form a slender, almost regular collective nerve; peduncles about 11 cm. long, very slender; spathe lance-oblong, green, 1 cm. wide or more; spadix borne on a slender stipe 1 cm. long, cylindric, very obtuse, about 4.5 cm. long and 5–6 mm. in diameter.

Mountains of Chiriquí, Panama, at 1300–2000 m., on trees in humid forest.

CHIRIQUÍ: Río Chiriquí Viejo Valley, *Peggy White 160* (TYPE); Bajo Mona, Río Caldera, *Woodson, Allen & Seibert 1026;* Cerro Punta, *Allen 1531;* Río Chiriquí Viejo, 1300–1900 m., *Seibert 146, 219.*

24. ANTHURIUM MICROSPADIX Schott, Oesterr. Bot. Zeitschr. 8:180. 1858.
Anthurium tapinostachyum Schott, Oesterr. Bot. Zeitschr. 8:180. 1858.

Plants terrestrial and probably also epiphytic, the caudex creeping or scandent, slender, with short or elongate internodes; cataphylls linear, acuminate, finally deciduous; petioles less than half as long as the blades, 9–18 cm. long, slender, geniculate 1 cm. or less below the apex; blades epunctate, thin when dried, oblong-lanceolate, 20–25 cm. long, 5–7 cm. wide, acute or acuminate, slightly paler beneath, obtuse or rounded at the base, the primary lateral nerves 15–18 on each side, ascending at an angle of about 45 degrees, united to form a distinct, prominent collective nerve near the margin; peduncles longer or shorter than the petioles; spathe lanceolate, acuminate, green, about 4 cm. long; spadix borne on a stipe 4–5 mm. long, obtuse or acute, cylindric, 4–5 cm. long, 3–4 mm. thick.

Humid forest, Costa Rica to Ecuador, chiefly at 250–1,300 meters.

CHIRIQUÍ: Río Ladrillo, above El Boquete, 1200–1300 m., *Pittier 3063.*

The single Panama collection was determined by Krause.

25. ANTHURIUM PALLENS Schott, Oesterr. Bot. Zeitschr. 8:180. 1858.

Plants epiphytic, more or less scandent or creeping, with numerous long roots arising from the nodes, the caudex slender, as much as 7 mm. in diameter; cataphylls linear, elongate, brownish, soon deciduous; petioles very slender, sometimes longer than the blades but usually shorter, 12–30 cm. long, geniculate 1–1.5 cm. below the apex, the node very slender; blades almost membranaceous when dried, epunctate, lance-oblong, 12–24 cm. long, 3–6.5 cm. wide, caudate-acuminate, obtuse or rounded at the base, the numerous primary lateral nerves diverging at a rather wide angle, very slender, prominent, united to form a distinct and almost regular collective nerve 3 mm. or more from the margin; peduncles slender, equaling or shorter than the petioles, 20 cm. long or less, very slender; spathe lance-linear, long-acuminate, green or yellowish green, 4–4.5 cm. long,

4–7 mm. wide; spadix conspicuously stipitate, cylindric, 2.5–3.5 cm. long, obtuse, pale yellow or yellowish green; ovary short-ovoid, with a very short style.

Humid forests of the mountains of Costa Rica and Panama, at 1,400–2,600 meters.

CHIRIQUÍ: Bajo Chorro, Boquete District, *Davidson 41;* Upper Río Caldera above El Boquete, *Maxon 5707;* Los Siguas Camp, Cerro de la Horqueta, *Pittier 3187;* Holcomb's Trail, above El Boquete, *Killip 3521;* vicinity of Bajo Mona and Quebrada Chiquero, 1500 m., *Woodson & Schery 549.*

26. ANTHURIUM TALAMANCAE Engler, Bot. Jahrb. 25:387. 1898.

Caudex with short internodes; cataphylls greatly elongate; petioles almost equaling or shorter than the blades, very slender, about 30 cm. long, geniculate 1.5 cm. below the apex; blades subcoriaceous, oblong, about 35 cm. long and 15 cm. wide, caudate-acuminate, subtruncate or subcordate at the base, with very short, rounded basal lobes, the primary lateral nerves 1.5–2 cm. apart, slender but prominent beneath, united 3–4 mm. from the margin to form a distinct collective nerve; peduncles 30 cm. long; spathe linear-lanceolate, long-cuspidate, decurrent at the base, 8 cm. long, 1.5 cm. wide; spadix borne on a stipe 5 mm. long, slender-cylindric, 8–9 cm. long, 5 mm. thick; sepals 1 mm. wide and slightly longer; ovary ovoid.

Known certainly only from the original Panama collection.

BOCAS DEL TORO: Shirores, Talamanca, in forest at 100 m., *Tonduz 9229, 9233* (TYPES). COCLÉ: hills north of El Valle de Antón, 1000 m., *Allen 2204* (sterile and determination questionable).

27. ANTHURIUM SCOLOPENDRINUM (Ham.) Kunth, Enum. Pl. 3:68. 1841.
Pothos scolopendrinus Ham. Prodr. 16. 1825.
Anthurium inconditum Schott, Oesterr. Bot. Zeitschr. 8:181. 1858.

Plants small, epiphytic, the caudex very short or almost none, thick, with short internodes; petioles slender, half as long as the blades or usually much shorter, somewhat dilated at the base, geniculate just below the apex; blades thin and almost membranaceous when dried, oblanceolate or narrowly oblong-oblanceolate, commonly 11–28 cm. long and 2–5 cm. wide, gradually acuminate or long-acuminate, long-attenuate to the very narrow, stipe-like base, the costa slender or stout, prominent, the lateral nerves very numerous, oblique, ascending at an angle of about 45 degrees, slender, united rather remote from the margin to form a distinct collective nerve; peduncles slender, equaling or longer than the leaves, or sometimes shorter; spathe narrowly lanceolate, pale green, usually 2.5 cm. long or less, subulate-attenuate; spadix very slender, sessile or subsessile, green, sometimes 10 cm. long but usually much shorter, obtuse; berries scarlet, 7 mm. long or less, few and scattered in the fruiting spadix.

On trees in humid forest, Guatemala to southern Brazil, chiefly at low elevations but in Costa Rica ascending to 1,200 meters or higher.

CANAL ZONE: Barro Colorado Island, *Kenoyer 187; L. H. & E. Z. Bailey 406; Woodworth & Vestal 702;* Caño Quebrado, *Pittier 6657;* without locality, *Mrs. Gaillard* in 1909; Colón to Empire, *Crawford 557.* PANAMÁ: Río Tapia, *Standley 26218.* DARIÉN: Crest, Cana-Cuasi trail, Chepigana District, *M. E. & R. A. Terry 1570.* BOCAS DEL TORO: Little Bocas, Chiriquí Lagoon, *Wedel 2532.*

28. ANTHURIUM MICHELII Guillaumin, Bull. Mus. Hist. Nat. Paris 31:263. 1925.

Caudex short; petioles one-fifth to one-third as long as the blade, 2.5–6.5 cm. long, geniculate 1 cm. below the apex; blades oblanceolate, 13–21 cm. long, 5–6.5 cm. wide, thick but not coriaceous, membranaceous when dried, attenuate from the upper third to the apex and abruptly acuminate, cuneate-attenuate to the base, the lateral nerves straight, united to form a collective nerve 6–8 mm. from the margin; peduncles 21 cm. long, about equaling the leaves, slender; spathe lanceolate, acuminate, green, 3 cm. long, 8 mm. wide; spadix yellow, borne on a stipe 1 cm. long, green, cylindric, 2.5 cm. long, 4 mm. thick, in fruit as much as 9–15 cm. long; berries ovoid, reddish black, 12 mm. long, 7 mm. thick, slightly attenuate at the apex, dark red above, whitish below, the cells 1-seeded; seeds oblong, 7 mm. long, attenuate at the base, the testa smooth, white.

Known only from Panama. Described from living plants collected by Michel in Panama, the locality unknown.

BOCAS DEL TORO: hills behind Fish Creek, Chiriquí Lagoon, *Wedel 2276, 2371.*

29. ANTHURIUM RAMONENSE Engler ex Krause, Notizbl. Bot. Gart. Berlin 11:611. 1932.

Plants coarse, epiphytic, sometimes terrestrial, the caudex very short or almost none, thick; petioles stout, 10–16 cm. long, the node short and rather stout; blades subcoriaceous when dried, black-punctate beneath, often densely so, oblanceolate-oblong, 25–38 cm. long, mostly 9–11 cm. wide, rather abruptly short-acuminate, long-attenuate from the upper third to the narrow base, the primary lateral nerves numerous, rather stout and prominent, ascending at an angle of 45 degrees or more, united to form a distinct, regular collective nerve 2–3 mm. from the margin; peduncles slender, terete, 11–35 cm. long; spathe linear-lanceolate, green tinged with dark red, or purplish white, acuminate, 5–10 cm. long, 5–10 mm. wide; spadix subsessile, caudiform, 11–22 cm. long, 4–5 mm. thick, reddish brown; sepals oblong; pistils ovoid.

On trees in humid forest, Costa Rica and Panama, ascending from sea-level to 1,200 meters.

CANAL ZONE: Río Indio de Gatún, *Pittier 2796;* Barro Colorado Island, *Standley 41149.* BOCAS DEL TORO: Western River, Chiriquí Lagoon, *Wedel 2789.*

30. ANTHURIUM HACUMENSE Engler, Bot. Jahrb. 25:363. 1898.
Anthurium concolor Krause, Notizbl. Bot. Gart. Berlin 11:606. 1932.

Plants epiphytic, rather large and coarse, the caudex short or almost none, very thick; petioles about one-fifth as long as the blades or shorter, stout, short-vaginate, about 10 cm. long, often 1 cm. or more in diameter, the very thick node as much as 2 cm. long; blades coriaceous, oblanceolate-spatulate to obovate-cuneate, commonly 60–70 cm. long and 15–20 cm. wide, obtuse to rounded at the apex and cuspidate-apiculate, gradually narrowed from the upper third to the long, attenuate base, the lateral nerves numerous, the primary ones rather stout and prominent, ascending at an angle of 45 degrees or more, 2.5–3 cm. apart, united to form a distinct, prominent, regular connective nerve 1.5–2 cm.

from the margin; peduncles as much as 50 cm. long, rather stout; spathe 9 cm. long or more, apparently early deciduous; spadix borne on a stout stipe 8–14 cm. long, the spadix cylindric, 12–17 cm. long, 1.5–2 cm. thick, obtuse; sepals 3 mm. long, 1 mm. wide; ovary ovoid, 3 mm. long, contracted into a style 1 mm. long.

On trees in humid forest, Panama and Costa Rica, at 250 meters or less.

CANAL ZONE: Río Indio de Gatún, *Pittier 2793, 2797, 2798* (TYPE of *A. concolor*); Frijoles, *Pittier 3748;* hills north of Frijoles, *Standley 27544.* COLÓN: Porto Bello, *Maxon 5732.*

The species is noteworthy for the greatly elongate stipe of the spadix, a character not found in any other Panama species of *Anthurium.*

31. ANTHURIUM GRACILE (Rudge) Lindl. Bot. Reg. 19:1635. 1833, excluding plate.

Pothos gracilis Rudge, Pl. Guian. 1:23, *pl. 32.* 1805.
Anthurium Friedrichsthalii Schott, Oesterr. Bot. Wochenbl. 5:65. 1855.
Anthurium gracile (Rudge) Lindl. var. *Friedrichsthalii* (Schott) Engler in DC. Monogr. Phan. 2:118. 1879.
Anthurium Rudgeanum Schott, Prodr. Aroid. 448. 1860.
Anthurium linearifolium Engler, Bot. Jahrb. 25:370. 1898.

Fig. 80. *Anthurium gracile*

Plants rather small, epiphytic, the caudex commonly short, thick, with very short internodes, the cataphylls soon weathering into fibers; petioles slender, one-fourth as long as the blades or usually much shorter, subterete, somewhat dilated at the base, nodose near the apex; blades linear or lance-linear, 15–40 cm. long, 1.5–3.5 cm. wide, acute to attenuate-acuminate, cuneately narrowed to the base, very thick and coriaceous when dried, dark green above, slightly paler beneath, punctate on both surfaces, the costa rather stout, very prominent, the primary lateral nerves numerous, ascending at a narrow angle, slender, prominent, at least beneath, united near the margin to form a distinct collective nerve; peduncles slender, equaling or more often shorter than the leaves; spathe reddish, linear or linear-lanceolate, usually 3–4 cm. long and much shorter than the spadix, acute or acuminate; spadix reddish brown, sessile, slender-cylindric, 4–8 cm. long, 3–5 mm. thick, obtuse, slightly attenuate upward; sepals 1.5 mm. wide, 1 mm. long; pistil depressed-globose, about 1.5 mm. wide and 1 mm. long; berries orange-red.

On trees in wet forest, at low elevations, Guatemala to the Guianas, Amazonian Brazil, and Peru.

CANAL ZONE: Balboa, cultivated, *Standley 28556;* hills north of Frijoles, *Standley 27457;* Mohinga Swamp, *Bailey 589;* Gatún, *Hayes;* Barro Colorado Island, *Shattuck 102, 200, 594; Aviles 62, 917; Standley 31339; Kenoyer 186.* COLÓN: Río Fató, *Pittier 3916.* DARIÉN: Pinogana, *Pittier 6525;* Boca de Pauarandó, Sambú River, *Pittier 5682.* COCLÉ: Bismarck, above Penonomé, *Williams 606.* BOCAS DEL TORO: Water Valley, Chiriquí Lagoon, *Wedel 1373.*

The material referred here is quite uniform in leaf form, but not too sharply separated from some of the following species. *Pittier 3916,* which differs in no respect from the other collections cited, was determined by Krause as *A. Bakeri* Hook. f., evidently in error. The type of *A. Friedrichsthalii* was collected on Cativo Island by Friedrichsthal, a locality referred by Schott and Engler erroneously to Guatemala. The type of *A. linearifolium* is *Lehmann 4538* from the Río "Chaques" (presumably Chagres), Isthmus of Panama.

32. ANTHURIUM LITTORALE Engler, Bot. Jahrb. 25:405. 1898.

Fig. 81. *Anthurium littorale*

Plants coarse, epiphytic, the caudex short or almost none, with very short internodes; cataphylls rusty brown, soon weathering into coarse fibers; petioles stout, semiterete, 2.5–5 cm. long, broadly canaliculate, geniculate just below the apex; blades thick-coriaceous when dried, oblong-lanceolate to oblong-elliptic, 14–30 cm. long, 4.5–10 cm. wide, obtuse and apiculate at the apex or subacute and short-cuspidate, acute at the base, the costa very thick and prominent beneath, the primary lateral nerves 9 or more on each side, ascending at a narrow angle, slender, united rather remote from the margin to form a distinct collective nerve; peduncles reported to attain a length of 25 cm. but usually much shorter; spathe linear-lanceolate, one-third as long as the spadix or often much shorter, 5–8 cm. long, 5–10 mm. wide, acute or subobtuse and apiculate; spadix caudiform, obtuse, slightly attenuate upward, often 20 cm. long but in early anthesis frequently much shorter, to 8 mm. in diameter; sepals 2 mm. wide and 1.5 mm. long; ovary depressed-globose.

On trees in humid forest, chiefly at or near sea level, Panama and Costa Rica.

CANAL ZONE: Barro Colorado Island, *Woodworth & Vestal 680; Shattuck 661; Kenoyer 182; L. H. & E. Z. Bailey 400.* COCLÉ: north rim of El Valle, *Allen & Alston 1843a.*

33. ANTHURIUM ACUTANGULUM Engler, Bot. Jahrb. 25:371. 1898.

Plants large and coarse, epiphytic, the caudex short and thick, with very short internodes, the cataphylls weathering into coarse, brown fibers; petioles stout, mostly 12–18 cm. long and 5–6 mm. thick, carinate, broadly canaliculate above, geniculate 5–6 mm. below the apex, the node thick, compressed; blades subcoriaceous when dried, elliptic or oblong-elliptic, 20–35 cm. long, 10–13 cm. wide, rounded or obtuse at the apex and cuspidate-acuminate, obtuse at the base or cuneately acute, rarely abruptly contracted, the costa very prominent beneath, rather stout, the primary lateral nerves about 9 on each side, distant, ascending at a rather wide angle, united remote from the margin to form a distinct collective nerve; peduncles slender or stout, often equaling the leaves but frequently much shorter; spathe attaining at least 7 cm. in length (no perfect one seen), often deciduous; spadix caudiform, very slender, sessile or short-stipitate, 15–23 cm. long, 4–6 mm. thick, very slightly attenuate upward, obtuse; sepals 3 mm. wide, 2 mm. long; ovary subglobose, 2 mm. in diameter; berries 5 mm. in diameter.

On trees in humid forest, usually at or near sea-level but ascending to 1,650 meters, Panama and Costa Rica.

CANAL ZONE: Río Indio de Gatún, *Maxon 4865; Pittier 2796, 2799;* Barro Colorado Island, *Aviles 16.* COLÓN: Río Sirrí, *Pittier 4024.* DARIÉN: Crest, Cana-Cuasi trail, Real District, 1650 m., *M. E. & R. A. Terry 1580.*

34. ANTHURIUM JOSEANUM Engler, Pflanzenreich IV. 23B:68. 1905.

Anthurium validifolium Krause, Notizbl. Bot. Gart. Berlin 11:607. 1932.

Plants rather coarse and stout, epiphytic, the caudex short and thick, often almost none, the long cataphylls soon weathering into abundant, coarse fibers; petioles rather stout, half as long as the blades or often much shorter, rounded dorsally, geniculate near the apex; blades coriaceous when dried and usually pale, elongate-lanceolate or merely lanceolate, 30–70 cm. long and 4–9 cm. wide or even larger, gradually long-attenuate, narrowed toward the acute base, about equally narrowed to each end, the costa slender or rather stout, very prominent beneath, the primary lateral nerves often as many as 20 on each side, ascending usually at an acute angle but sometimes spreading rather widely, slender but strongly salient, united near the margin to form a distinct collective nerve; peduncles slender, equaling or often much longer than the petioles; spathe lanceolate, sometimes 15 cm. long and 2 cm. wide at the base but often much smaller, purplish or yellowish green; spadix caudiform or slender-cylindric, short-stipitate or almost sessile, reddish purple, attenuate upward and obtuse, in fruit as much as 25 cm. long and 8 cm. thick, at anthesis usually smaller; sepals 3.5 mm. long; pistils oblong, 5–6 mm. long; berries orange.

On trees or rarely terrestrial, mostly at middle or rather high elevations, Panama and Costa Rica.

BOCAS DEL TORO: Río Cricamola, 10–50 m., *Woodson, Allen & Seibert 1889* (perhaps a distinct species); Isla Colón, *Wedel 125*. CHIRIQUÍ: Río Ladrillo above El Boquete, 1200 m., *Pittier 3052* (TYPE of *A. validifolium*), *3160, 3161, 3062*; Casita Alta, Volcán de Chiriquí, *Woodson, Allen & Seibert 970*; Chiriquí Viejo, 1300–1900 m., *Seibert 172, 289*; Bajo Chorro, Boquete District, 1800 m., *Davidson 225, 276*; Paso Ancho to Monte Lirio, upper valley of Río Chiriquí Viejo, 1500–2000 m., *Allen 1506*; Quebrada Velo, 1800 m., *Woodson & Schery 253, 265*.

The material referred here is slightly variable and it is possible that more than a single species is represented. At first glance one would take *A. validifolium* to be a distinct species, but closer examination has failed to reveal any dependable character by which it may be separated.

35. ANTHURIUM TURRIALBENSE Engler, Bot. Jahrb. 25:406. 1898.

Plants epiphytic, the caudex short and thick, with very short internodes, the cataphylls soon weathering into brown fibers; petioles rather stout and angulate, one-fourth as long as the blades, geniculate 7 mm. below the apex, the node thick; blades coriaceous when dried, conspicuously black-punctate on both surfaces, linear-lanceolate, 40–65 cm. long, 4.5–6 cm. wide, attenuate-acuminate, gradually cuneate-attenuate to the base, the primary lateral nerves very numerous, slender, prominent, scarcely stouter than the secondary ones, ascending at an angle of about 45 degrees, united 5 mm. from the margin to form a distinct collective nerve; peduncles twice as long as the petioles, rather slender; spathe broadly linear, 3–6.5 cm. long, 1 cm. wide or less, apiculate; spadix short-stipitate, 6–12.5 cm. long, 5–7 mm. thick, obtuse, slightly attenuate upward.

On trees in humid forest, at 500 m. or less, Panama and Costa Rica.

CANAL ZONE: Barro Colorado Island, *Standley 31386, 40887; Bailey 626*. SAN BLAS: hills of Sperdi, near Puerto Obaldía, *Pittier 4414*. BOCAS DEL TORO: Isla Colón, Chiriquí Lagoon, *Wedel 2857*.

The Barro Colorado specimens are sterile and it is quite possible that they represent a distinct species, since their leaves are proportionately broader than in the typical form.

36. ANTHURIUM CHIRIQUENSE Standl. Field Mus. Bot. Ser. 22:67. 1940.

Plants rather large and coarse, epiphytic, the caudex short and thick, with very short internodes, the numerous cataphylls weathering into coarse, stramineous fibers; petioles subterete, almost equaling the blades, 20–30 cm. long, stout, geniculate about 8 mm. below the apex, the node thick; blades narrowly elliptic-oblong, mostly 29–35 cm. long and 7–10 cm. wide, obtuse at the apex and abruptly cuspidate-acuminate, broadly cuneate or subobtuse at the base, subcoriaceous when dried, epunctate, the costa slender, prominent on both surfaces, the primary lateral nerves numerous, not or scarcely stouter than the secondary ones, ascending at an angle of about 45 degrees, united 5–9 mm. from the margin to form a distinct collective nerve; peduncles stout, 45 cm. long, usually almost twice as long as the petioles; spathe purplish green, oblong-lanceolate, 6.5 cm. long, 1 cm. wide, acuminate; spadix purplish, slender-cylindric, obtuse, sometimes slightly attenuate upward, 12–25 cm. long, 7 mm. thick near the base.

Known only from western Panama, at 1000–1800 m., growing on trees in rain forest.

CHIRIQUÍ: Bajo Chorro, Boquete District, *Davidson 283* (TYPE), *312*. COCLÉ: hills north of El Valle de Antón, *Allen 2165*.

37. ANTHURIUM ALLENII Standl. Field Mus. Bot. Ser. 22:66. 1940.

Plants epiphytic, the caudex short and thick, with very short internodes, the cataphylls weathering into coarse, brown fibers; petioles rather slender, 20–26 cm. long, geniculate 10–14 mm. below the apex, the node no thicker than the petiole; blades oblong-lanceolate, slightly widest toward the base, subcoriaceous when dried, dark-punctate on both surfaces, 30–40 cm. long, 6.5–10.5 cm. wide, acuminate and abruptly cuspidate, obtuse or short-cuneate at the base, the slender costa prominent on both surfaces, the primary lateral nerves numerous, very slender, only slightly prominent, scarcely or not at all stouter than the secondary ones, ascending at an angle of about 45 degrees, united 7 mm. from the margin to form a distinct but very slender collective nerve; peduncles 18–35 cm. long, slender, longer or shorter than the petioles; spathe oblong-lanceolate, 5 cm. long, 1 cm. wide, apiculate; spadix short-stipitate, cylindric or almost caudiform, in anthesis narrowed upward and about 9 cm. long, 5 mm. thick, in age 14 cm. long and almost 1 cm. thick.

Known only from the type region, Province of Coclé, Panama, at 100–800 meters, growing on trees in wet forest.

COCLÉ: north rim of El Valle, *Allen & Alston 1819* (TYPE), *1854*.

3. UROSPATHA Schott

UROSPATHA Schott, Aroid. 3. 1853.

Terrestrial plants, growing in swamps, the rhizome horizontal or vertical, spongy; leaves basal, few, the petioles elongate, vaginate only at the base, smooth or verrucose, the blade sagittate, the primary lateral nerves ascending at a narrow angle, the secondary nerves transverse and reticulate; peduncle terminal, equaling or longer than the leaves; spathe erect, usually colored outside, whitish within, convolute below, open at the middle and above, the limb usually long-attenuate, contorted, and persistent; spadix short-stipitate or sessile, much shorter than the spathe, densely many-flowered, bearing near the base sterile flowers similar to the fertile ones but smaller; flowers perfect, perigoniate; sepals 4–6, fornicate, subtruncate at the apex; stamens 4–6, the filaments rather broad, compressed, abruptly contracted at the apex into the connective, scarcely longer than the ovary; anthers longer than the connective, the cells ovate-elliptic, dehiscent by an extrorse, apical slit; pistil truncate-conic, incompletely 2-celled, the ovules 2 or more in each cell, attached by long funicles; berry 2-celled, surrounded by the accrescent perianth, by abortion 1- or 2-seeded.

Engler enumerates 15 species, all native in tropical America, three of them described from Central America.

1. UROSPATHA GRANDIS Schott, Bonplandia 7:128. 1857.

Leaves unknown; spathe 40–45 cm. long, open from the base upward, scarcely contorted at the apex, at the base as much as 15 cm. wide; spadix rather long-stipitate, 4.5–7 cm. long, 1 cm. in diameter, very obtuse, the stipe adnate dorsally to the spathe.

Known only from the original Panama collection.

CANAL ZONE: Chagres, *Fendler 434*.

Probably synonymous is *Urospatha Tonduzii* Engler, Anal. Inst. Fís.-Geogr. Costa Rica 8:364. 1895, described from Matina on the Atlantic Coast of Costa Rica. This can be decided only when complete material of the Panama plant has been collected. *U. grandis* was described from inflorescences only. A cotype is in the herbarium of the Missouri Botanical Garden. In Central America the species of the genus seem to be confined to *Manicaria* swamps of the Atlantic coast.

4. MONSTERA Adans.

MONSTERA Adans. Fam. Pl. 2:470. 1763.

Large and coarse, scandent epiphytes, rooting at the nodes; leaves distichous, the juvenile ones usually appressed to the tree trunk, ovate or ovate-cordate, short-petiolate, not perforated; petioles vaginate to the middle or higher, the sheath persistent or deciduous; blades various, entire and asymmetric or more often perforated or pinnatifid; peduncles terminal, solitary or several; spathe ovate or oblong-ovate, apiculate, cymbiform-convolute, closed after fecundation, finally deciduous; spadix sessile, free, cylindric, densely many-flowered, shorter than the spathe, the lowest flowers sterile, the others perfect, naked; stamens 4, the filaments rather broad and compressed, abruptly narrowed into the slender, acuminate connective, scarcely longer than the pistil; anthers 2-celled, the cells oblong, apiculate, longer than the connective, dehiscent by lateral slits; ovary obconic-prismatic, 2-celled, the cells 2-ovulate; ovules anatropous, on very short funicles; style equaling the ovary but thicker, truncate at the apex and slightly elevated at the middle, the stigma depressed-oblong or linear; fruits crowded, baccate, juicy; seeds obverse-ovate or subcordate, subcompressed.

An American genus, of about 30 species, 11 of which have been recorded as Central American. The plants constitute a large element of the conspicuous epiphytic vegetation of the lowland forests, where they are more than ordinarily conspicuous because of their large and curious leaves, usually either perforated or pinnatifid. Some of the species have become common house and hot-house plants in the United States. Their succulent foliage withstands well the trying effect of steam-heated air. The fully ripened spadices are juicy and sweet, and rather good to eat. The long, flexible, tough aerial roots of *Monstera* and *Philodendron*, which often attain a length of several meters, are much used in some parts of Central America for making the so-called "mimbre" furniture, much like the willow or

rattan furniture of the United States. In Guatemala and Salvador, for instance, this is quite an important industry.

a. Leaves entire, not perforated ..... 1. M. PITTIERI
aa. Leaves pinnatifid or entire and perforated.
b. Leaf blades regularly pinnatifid.
c. Blades perforated along the costa ..... 2. M. DELICIOSA
cc. Blades not perforated ..... 3. M. DILACERATA
bb. Leaf blades not regularly pinnatifid, often entire, sometimes cleft to the perforations in a few places ..... 4. M. PERTUSA

Fig. 82. *Monstera Pittieri*

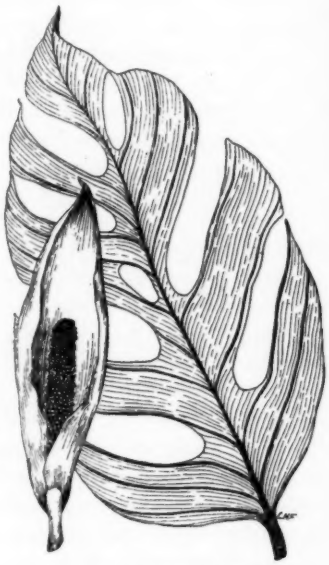

Fig. 83. *Monstera deliciosa*

1. MONSTERA PITTIERI Engler, Bot. Jahrb. 37:116. 1905.

A small, epiphytic vine, the caudex slender, its internodes mostly 4–5 cm. long; petioles almost as long as the blades, vaginate to within about 1.5 cm. of the apex, geniculate 1 cm. below the base of the blade; blades subcoriaceous and usually fuscous when dried, obliquely oblong, 10–20 cm. long, 3.5–8.5 cm. wide, short-acuminate, very oblique at the base, the primary lateral nerves slender, few, extending to the margin; peduncles slender, 10 cm. long or less; spathe broadly oblong, 4–5 cm. long, 2 cm. wide; spadix sessile, cylindric, 3–5 cm. long, in fruit almost 2 cm. thick but at anthesis about 8 mm. thick, obtuse; stamens slightly more than half as long as the pistil, spatulate, the anther cells ovoid, divergent; pistil cylindric.

Humid forests of Panama and Costa Rica, usually at low elevations.

CANAL ZONE: Barro Colorado Island, *Aviles 91; Starry 17; Shattuck 6, 27.* COCLÉ: El Valle, 600–1000 m., *Allen 1227.*

2. MONSTERA DELICIOSA Liebm. Vid. Medd. Naturh. For. 19. 1850.

A large, coarse, epiphytic vine, often climbing high on trees, the caudex terete, as much as 6 cm. or even more in diameter, the internodes often 7 cm. long or more, the nodes frequently emitting long aerial roots that dangle far below the caudex; petioles 1 m. long or less, 2–2.5 cm. in diameter, the sheath ending far below the base of the blade, the node as much as 3 cm. long; blades of the primary leaves small, cordate, entire, of the succeeding leaves ovate-cordate and sparsely perforated; blades of the adult leaves 40–60 cm. wide or larger, thick-coriaceous when dried, bright green and lustrous above, somewhat paler beneath, cordate-ovate in outline, almost regularly pinnatifid and with few or numerous perforations along the costa, the segments linear or broadly linear, somewhat dilated toward the apex and cuspidate-acuminate; peduncles 10–15 cm. long, 1–1.5 cm. thick; spathe coriaceous, broadly ovate, apiculate, 20–25 cm. long, 15–17 cm. wide when spread out, pale yellowish; spadix 17–20 cm. long, becoming thick and juicy in fruit; pistils turbinate; berries pale yellow, somewhat tinged with violet, 1 cm. long.

On trees in humid lowland forest, Panama to southern Mexico.

CANAL ZONE: Barro Colorado Island, *Kenoyer 183*. CHIRIQUÍ: Río Boquete below Quiel, 1000–1300 m., *Pittier 3151;* Bajo Chorro, 1900 m., *Woodson & Schery 634*.

This species is well known in some parts of Central America, as well as in Mexico, by the name *Piñanona*. It is the species of *Monstera* most often seen in cultivation in the United States and elsewhere. The fruiting spadices are larger than those of other species, sweet and juicy when fully ripened, and rather good to eat.

3. MONSTERA DILACERATA C. Koch, Ind. Sem. Hort. Berol. App. 5. 1855.

A large vine, the caudex often greatly elongate, as thick as a finger, the internodes 3–12 cm. long; blades of the juvenile leaves oblong-elliptic, gradually narrowed to the apex, acute or subobtuse at the base; petioles of the adult leaves 25–35 cm. long, stout, marginate almost to the node; blades fuscous when dried and subcoriaceous, obliquely oblong-ovate in outline, commonly rounded or emarginate at the base and abruptly contracted to the petiole, not perforated but almost regularly pinnatifid, with 3–5 divisions on each side, these broadly linear, long-acuminate or attenuate, usually 3–4 cm. wide; peduncles stout, 15–20 cm. long; spathe ovate, yellowish, about 12 cm. long; spadix cylindric, obtuse, 5–6 cm. long, 1.5 cm. thick; pistils prismatic, 4–5 mm. long, the stigma oblong.

On trees in humid lowland forest, sometimes ascending to 1700 m., Costa Rica to Colombia, and probably farther southward.

PANAMÁ: Barro Colorado Island, *Standley 41037; Aviles 45; Kenoyer 179; Frost 206*. CHIRIQUÍ: Callejón Seco, Volcán de Chiriquí, 1700 m., *Woodson & Schery 501*.

The name *Bejuco de Murciélago* is reported locally for the species.

4. MONSTERA PERTUSA (L.) de Vriese, Hort. Spaarn-Bergens. 40. 1839.

Dracontium pertusum L. Sp. Pl. 968. 1753.
Monstera Seemannii Schott, Oesterr. Bot. Zeitschr. 9:40. 1859.

Usually a large, epiphytic vine, the caudex terete, 1–3 cm. thick, the internodes 5–10 cm. long; blades of juvenile leaves ovate, oblong-ovate, or oblong-elliptic, entire and not perforated; petioles of adult leaves 20–35 cm. long, vaginate to the node; blades ovate-oblong to almost rounded-ovate, commonly 30–40 cm. long and 15–20 cm. wide, acute and usually cuspidate-acuminate or short-cuspidate, rounded or short-cuneate at the base, with few or numerous large and small perforations, the smaller ones irregularly scattered or absent, some of the perforations usually extending to the margin, the blade thus somewhat pinnatifid although not regularly so; peduncles 10–15 cm. long; spathe coriaceous, oblong, acuminate, 15–20 cm. long, 10 cm. wide when expanded, greenish at first, becoming whitish or yellowish; spadix cylindric, in fruit about 10 cm. long and 1.5–2 cm. thick; pistils subprismatic, 4 mm. long; berries obovoid, pale, 5–6 mm. long, mostly 1-seeded; seeds obliquely cordiform, smooth, brown, 4 mm. long, laterally somewhat compressed.

On trees in humid forest, chiefly at low elevations, southern Mexico to the West Indies and southern Brazil.

CANAL ZONE: Las Cascadas Plantation, near Summit, *Standley 25736;* Ancón, *Pittier 2752.* COLÓN: Fató, *Pittier 3841.* PANAMÁ: Río Tapia, *Standley 28133;* Taboga Island, *Standley 27877;* between Matías Hernández and Juan Díaz, *Standley 31990;* near Arraiján, *Woodson, Allen & Seibert 1339;* savannas north of Panamá, *Bro. Paul 547.* CHIRIQUÍ: southern slope of Cerro de la Horqueta, 1700 m., *Pittier 3178, 3179;* Quebrada Velo, 1800 m., *Woodson & Schery 279.* BOCAS DEL TORO: Johns Creek, Chiriquí Lagoon, *Wedel 2755;* Isla Colón, Chiriquí Lagoon, *Wedel 2609.*

Illustrated, Pflanzenreich IV. 23B:104. The material referred here is variable and difficult to understand. Moreover, only a few of the collections are in good condition for study. It is probable that more than a single recognizable form is represented, but more material will be necessary before a satisfactory disposition of the allied local forms can be made. One of the Chiriquí collections was referred by Krause to *M. Parkeriana* Schott, and it does agree perfectly with a photograph of the type of that species. However, it is not apparent how *M. Parkeriana* is to be separated from *M. pertusa,* which Engler calls a "Typus polymorphus." Some of the Canal Zone specimens have been reported as *M. Friedrichsthalii* Schott, but apparently in error, that being a Costa Rican plant whose leaves have much more abundant perforations. H. H. Bartlett, who has studied some of the material here cited, has labeled some of the sheets as *M. obliqua* (Miq.) Walp., but in that species, as described by Engler, the spathes are much smaller than in any Panama specimens that I have seen. Bartlett also has labeled some of the sheets from the Zone region as a new species, but the description of any new species in the genus, with the material now available, is scarcely to be recommended. The local name of *Hierba de Puerco* is reported for *M. pertusa.*

5. SPATHIPHYLLUM Schott

SPATHIPHYLLUM Schott, Melet. 1:22. 1832.

Terrestrial, acaulescent herbs, rarely with a short caudex; petioles equitant,

usually long and slender, mostly geniculate near the apex and terete above the node, commonly vaginate to or above the middle; blades mostly oblong to ovate or lanceolate and cuspidate-acuminate, drying rather thin, the costa stout, the primary and secondary lateral nerves subparallel, approximate, ascending chiefly at a narrow angle, not united into a collective nerve; peduncles equaling or longer than the leaves, the spathe cuspidate, decurrent upon the peduncle, membranaceous, convolute in bud, explanate in anthesis, white or whitish; spadix sessile or stipitate, cylindric, erect, shorter than the spathe, densely many-flowered, flowering from the base upward; flowers perfect, perigoniate, typically 3-parted, sometimes 2- to 4-parted; sepals fornicate at the apex and subtruncate, coherent or united to form a truncate cup; stamens as many as the sepals and opposite them, the short filaments dilated and thickened at the apex, gibbous posteriorly, abruptly narrowed at the apex into the connective; anthers ovoid, the cells oblong, exceeding the connective, the cells subopposite, dehiscent by a longitudinal slit that scarcely extends to the base; ovary oblong, commonly 3-celled, the cells 2- to 8-ovulate, the ovules anatropous, attached by short funicles; style continuous with the ovary, conically elongate, and projecting beyond the perianth, or almost none; stigma 3- or 4-lobate, sessile; fruit baccate, rounded or conic at the apex, 3-celled, the cells 1- to 8-seeded; seeds oblong, slightly curved, somewhat reniform, pale yellowish, the testa sparsely striate-verrucose; endosperm abundant.

Engler and Krause recognize 27 species, widely distributed in tropical America, with one species in the Philippines and the central Malayan region. Seven species are known from Central America.

a. Style very short, not or scarcely exceeding the perianth, the fruiting spadices almost smooth, not tuberculate.
  b. Leaves mostly 3–7 cm. wide, the blades acute at the base; spadix 2–6 cm. long ..... 1. S. FLORIBUNDUM
  bb. Leaves mostly 13–20 cm. wide, the blades obtuse or rounded at the base; spadix 9–12 cm. long ..... 5. S. FULVOVIRENS
aa. Style elongate, conspicuously exceeding the perianth, the fruiting spadices thus strongly tuberculate.
  b. Spadix only 1.5 cm. long, few-flowered; leaf blades less than 6 cm. wide ..... 2. S. ZETEKIANUM
  bb. Spadix usually 5–10 cm. long, with very numerous flowers; leaf blades mostly more than 10 cm. wide.
    c. Leaf blades acute at the base; cells of the ovary 6- to 8-ovulate ..... 3. S. FRIEDRICHSTHALII
    cc. Leaf blades rounded at the base; cells of the ovary 2-ovulate ..... 4. S. PHRYNIIFOLIUM

1. SPATHIPHYLLUM FLORIBUNDUM (Linden & André) N. E. Brown, Gard. Chron. n. s. 10:783. 1878.

Anthurium floribundum Linden & André, Ill. Hortic. 21: *pl. 159.* 1874.

Leaves few or numerous, erect, the petioles 10–21 cm. long, geniculate 5–15 mm. below the apex, conspicuously vaginate, the green sheath extending sometimes almost to the apex of the petiole; blades oblong-lanceolate or oblong-elliptic, 13–24 cm. long, 2.5–7 cm. wide, very narrowly attenuate-acuminate, narrowed to the acute and slightly unequal base, the primary lateral nerves about 20 on each side, ascending at a narrow or rather wide angle; peduncles 20–35 cm. long, very slender, the stipitiform portion 5–10 mm. long; spathe white or green and white,

Fig. 84
Spathiphyllum floribundum

6–10 cm. long, 2–3 cm. wide, narrowly long-cuspidate-attenuate; spadix whitish or greenish yellow, cylindric, slightly attenuate to the apex, 2–6 cm. long, 5–8 mm. thick; sepals 1.5 mm. long and equally wide; pistils short-obpyramidal, 1.2 mm. long, the cells 1- or 2-ovulate.

Dense, wet forest, usually growing on the banks of small streams or on rocks along their banks, Panama to Colombia, at 800 meters or less.

CANAL ZONE: Río Paraíso, above East Paraíso, *Standley 29846;* reported by L. H. Bailey from Barro Colorado Island, *L. H. & E. Z. Bailey 209.* PANAMÁ: Río Tapia, *Standley 28125;* Río Chararé, above Chepo, *Pittier 4724.* COCLÉ: Río Valle Chiquito, 700–800 m., *Seibert 507.*

The systematic position of this plant has been clarified recently by Bailey (Gentes Herb. 4:309. 1940). Previously it had been referred (Standley, Fl. Canal Zone 103. 1928) incorrectly to S. *Patinii* (Hogg) N. E. Brown, another Colombian species, distinguished by its much longer petioles, a character perhaps of doubtful systematic importance. Illustrated, Pflanzenreich IV. 23B: *fig.54, A-E;* L. H. Bailey, Gentes Herb. 4:308. 1940.

2. SPATHIPHYLLUM ZETEKIANUM Standl. in Woodson & Schery, Ann. Missouri Bot. Gard. 27:267. 1940.

Plants slender, about 60 cm. high; leaves numerous, the petioles very slender, 12–20 cm. long, geniculate about 1 cm. below the apex, the sheath short, persistent, scarcely more than 8 cm. long; blades narrowly lanceolate or lanceolate, 13–20 cm. long, 2–5 cm. wide, narrowly long-acuminate, attenuate to the base, deep green above, much paler beneath, the primary lateral nerves about 6 on each side, subremote, ascending at a very acute angle; peduncle terete, slender, about 43 cm. long and 2 mm. thick, the stipitiform portion 3 cm. long; spathe lance-ovate, green, 10.5 cm. long, 3 cm. wide, abruptly caudate-acuminate, acute at the base; spadix cylindric, very obtuse, 1.5 cm. long, 6–7 mm. thick, few-flowered; sepals 6, biseriate, free; style about equaling the ovary, conspicuously exserted beyond the perianth, conic.

Known only from the original collection, from Panama.

CANAL ZONE: Zetek Trail, Barro Colorado Island, *D. E. Starry 27* (TYPE).

The foliage is similar to that of S. *floribundum,* but the spadices of the two species, while similar in size, are very unlike in general appearance.

3. SPATHIPHYLLUM FRIEDRICHSTHALII Schott, Aroid. 2. *pl. 4.* 1853.
Spathiphyllum Fendleri Schott, Oesterr. Bot. Wochenbl. 7:9. 1857.
Spathiphyllum lanceolatum C. Koch, Allgem. Gartenz. 25:174. 1857.

Fig. 85. *Spathiphyllum Friedrichsthalii*

Plants often large and robust, as much as a meter high; petioles 20–50 cm. long, stout, geniculate 2–2.5 cm. below the apex, usually vaginate to the middle or higher; blades oblong-lanceolate or elliptic-oblong, 20–50 cm. long and 10–16 cm. wide or even larger, short-acuminate or caudate-acuminate, narrowed to the usually very acute base, the primary lateral nerves numerous, ascending at a rather wide angle; peduncles sometimes a meter tall but usually shorter, stout; spathes white or greenish, elliptic or obovate-lanceolate, usually about 20 cm. long and 6–7 cm. wide but often smaller or larger, long-acuminate, long-decurrent upon the peduncle; stipitiform portion of the peduncle commonly adnate for 4–5.5 cm. and free for 0.5–1.5 cm.; spadix cylindric, very obtuse, usually 5–7 cm. long and 2 cm. thick; pistils ovoid-conic, twice as long as the perianth or longer, about 6 mm. long, the cells 6- to 8-ovulate.

Wet or damp, usually dense forest, Guatemala to Colombia.

CANAL ZONE: very common, and represented by numerous collections from the Atlantic slope. COCLÉ: north rim of El Valle, *Allen & Alston 1850.* COLÓN: Palenque, near sea level, *Pittier 4122.* BOCAS DEL TORO: Isla Colón, *Wedel 2979;* Río Cricamola, between Finca St. Louis and Konkintoë, *Woodson, Allen & Seibert 1912;* Water Valley, *Wedel 1360.* CHIRIQUÍ: Río Ladrillo, above El Boquete, 1200 m., *Maxon 5390;* El Boquete, 1250 m., *Killip 3639;* Chiquero, 1650 m., *Davidson 565.* DARIÉN: Cana-Cuasi trail, Chepigana District, 1200 m., *M. E. & R. A. Terry 1525.*

The plant is well known in most parts of Central America because of the fact that the young inflorescences are edible. They usually are prepared for the table by frying with eggs, but are treated also in other ways. They seem to be most popular in Salvador and along the Pacific slope of Guatemala. Illustrated, Pflanzenreich IV. 23B: *fig. 49, A-E.* The type of *S. Fendleri* is *Fendler 426* from Chagres.

4. SPATHIPHYLLUM PHRYNIIFOLIUM Schott, Oesterr. Bot. Wochenbl. 7:159. 1857.

Petioles stout, about 40 cm. long, geniculate 3 cm. below the apex, vaginate

to the middle or higher, the sheath narrow; blades broadly oblong, 35–55 cm. long, 18–23 cm. wide, narrowly long-cuspidate, rounded at the base or abruptly contracted into the petiole, the primary lateral nerves numerous, divergent at an angle of about 70 degrees; peduncles 60 cm. long or more, 5–6 mm. thick, the stipitiform portion 4 cm. long, adnate for three-fourths its length; spathe oblong-elliptic, cuspidate, gradually narrowed at the base and long-decurrent upon the peduncle, 15 cm. long, 5–6 cm. wide; spadix rounded at the apex, 8–10 cm. long, 12–14 mm. thick, or in fruit much thicker; pistils 4–5 mm. long, the style produced far above the perianth.

Moist or wet forest, Guatemala to Panama.

CANAL ZONE: Chagres, *Fendler 425* (TYPE). BOCAS DEL TORO: Shepherd Island, Chiriquí Lagoon, *Wedel 2690;* Old Bank Island, Chiriquí Lagoon, *Wedel 2068.*

The writer strongly suspects that S. *phryniifolium* is a synonym of S. *Friedrichsthalii,* and certainly the differences suggested for separating the two species are not convincing.

5. SPATHIPHYLLUM FULVOVIRENS Schott, Oesterr. Bot. Zeitschr. 8:179. 1858.

Plants almost a meter high; petioles slender, about 60 cm. long, geniculate 2 cm. below the apex; blades broadly elliptic, 30–40 cm. long, 15–20 cm. wide, long-cuspidate, broadly rounded or very obtuse at the base, somewhat asymmetric, the primary lateral nerves 13–15 on each side, divergent at a wide angle; peduncles 70–80 cm. long, 2 cm. or less in diameter, the stipitiform portion 1 cm. long; spathe deep green, oblong-lanceolate, about 12 cm. long and 2.5–3.5 cm. wide, cuspidate; spadix cylindric, 9–12 cm. long, grayish; pistils subturbinate, 4 mm. long, the cells 4-ovulate.

Wet forest, Costa Rica and Panama, the type from Pedregal, Costa Rica.

BOCAS DEL TORO: hills behind Fish Creek, Chiriquí Lagoon, *Wedel 2198.*

6. DRACONTIUM L.

DRACONTIUM L. Sp. Pl. 968. 1753.

Plants terrestrial, usually large, arising from hypogean tubers; leaf one, the petiole very long, vaginate only at the base, often tuberculate and maculate, the blade deeply 3-parted, the segments 2- to 3-parted and again pinnately parted; peduncle short, at least during anthesis; spathe oblong, cuspidate-acuminate, convolute below, open above, persistent; spadix short-stipitate, short-cylindric, free, densely many-flowered, much shorter than the spathe; flowers perfect, perigoniate; sepals 4–8, biseriate, dilated toward the apex and fornicate, irregularly imbricate; stamens 4–6, biseriate, the filaments slightly dilated, subcompressed, abruptly contracted at the apex into the connective; anthers much longer than the connective, linear-elliptic, dehiscent by a vertical slit; ovary ovoid, incompletely 2- to 5-celled, attenuate to the elongate style; ovules solitary; stigmas small, 2- to 5-parted; fruit baccate, surrounded by the perianth, obscurely 2- to 5-lobate; seeds rounded-reniform, somewhat compressed.

About 10 species are known, in tropical America. Three are known from Central America.

1. DRACONTIUM COSTARICENSE Engler, Pflanzenreich IV. 23C:44. *f. 17.* 1911.

Petioles smooth, brown-spotted; blade about 1 meter broad, 3-parted, the central segment pinnately parted, with 3 segments on each side, the ultimate segments cleft to the costa, oblong or oblong-elliptic, as much as 13 cm. long and 5 cm. wide, rounded to obtuse at the apex and often shortly cuspidate-acuminate, the terminal segments often bilobate, thin; peduncles slender, smooth, about 1 m. long, brown-spotted; spathe lanceolate, almost 30 cm. long; spadix short-stipitate, 6.5 cm. long, 1 cm. thick; sepals 6-7, spatulate; stamens becoming slightly longer than the sepals; ovary ovoid, 2-celled; style conoid, longer than the ovary.

Wet lowland forests of Panama and Costa Rica.

CANAL ZONE: Culebra, *Pittier 3429.*

The Panama record is based upon a single juvenile leaf that is probably referable to this species. The plant evidently is rare in the Zone, since it must be a large and showy one, yet has not been observed by other collectors in the region.

7. CALADIUM Vent.

CALADIUM Vent. in Roem. Archiv. 2:347. 1800.

Plants low, acaulescent or nearly so, arising from tuberous rhizomes, with usually only one leaf and one inflorescence arising at the same time from a single tuber; petioles elongate, the blades chiefly sagittate and peltate, the primary nerves few and spreading, the veins densely reticulate; peduncles elongate, solitary; tube of the spathe convolute, persistent, constricted in the throat, the blade cymbiform, white; spadix slightly shorter than the spathe, the lowest part naked and stipitiform, the pistillate inflorescence cylindric-conoid or ellipsoid, densely many-flowered, the sterile staminate portion of the spadix subconic, longer than the pistillate, the fertile staminate portion contiguous with the sterile, subclavate, densely flowered, twice as long as the pistillate part; flowers unisexual, naked; staminate flowers with 3–5 stamens, these connate to form a truncate-obpyramidal synandrium sinuously 6-angulate at the apex, the connective thick, plane at the apex, the anther cells oblong-lanceolate, rounded and emarginate at the base, opening by a short apical slit; ovary 2- or 3-celled, the ovules several in each cell, anatropous, biseriate; style none, the stigma depressed-hemispheric, obscurely 3- or 4-sulcate; fruit baccate, whitish, crowned by the remnants of the stigma, 2- or 3-celled, many-seeded; seeds ovoid, on very short funicles.

Sixteen species are recognized by Engler, all natives of tropical South America.

1. CALADIUM BICOLOR (Ait.) Vent. Descr. Cels. *pl. 30.* 1800.
Arum bicolor Ait. Hort. Kew. 3:316. 1789.

Plant arising from a small, depressed-globose rhizome; petioles very slender, 3 or more times as long as the blade, short-vaginate; blades broadly sagittate-ovate,

mostly 10–20 cm. long, acute or abruptly acute, peltate far above the base, the basal lobes obtuse, directed downward or slightly outward, separated by a broad, open, triangular sinus, the blades thin, glaucescent beneath, spotted above with white, pink, red, pale yellow or other colors; tube of the spathe ovoid, green outside, greenish white within, the blade about twice as long as the tube, cuspidate, white; pistillate portion of the spadix short-cylindroid, yellowish or pale orange, the fertile staminate portion twice as long as the pistillate, cylindric-fusiform.

Original habitat somewhat uncertain, but the plant is probably native of the Amazonian region, perhaps also of the Guianas. Most material in herbaria is taken from cultivated plants or from those naturalized about human settlements.

Panama. Cultivated commonly for ornament, and thoroughly naturalized at some places in the lowlands, particularly in Mount Hope Cemetery, Canal Zone.

Called *Corazón de Jesús* in Panama, and "Wild Coco" by the West Indians resident in the Canal Zone. The plant is well known in cultivation in the North, being highly esteemed for its delicately colored foliage. The leaves exhibit great variation in their coloring, so much so that it is usually difficult to find two plants whose leaves can be said to be exactly or even approximately alike. This species is the so-called "Fancy-leaved Caladium" of the United States. The plant of the same family—but with larger, green leaves—grown there, as well as in tropical America, for ornament under the name "Caladium" or "Elephant-ear" is *Colocasia antiquorum* Schott, native in the Old World tropics.

8. XANTHOSOMA Schott

XANTHOSOMA Schott, Melet. 19. 1832.

Plants usually large and coarse, terrestrial, arising from a hypogean tuber or from a more or less elongate, hypogean or epigean caudex; petioles long, thick, subterete, vaginate below; blades sagittate, hastate, or trisect or pedatisect, the primary lateral nerves of the blades or their segments united to form a more or less distinct collective nerve; peduncles solitary or aggregate, mostly short; tube of the spathe ovoid or oblong, convolute, persistent, constricted at its apex, the limb oblong-cymbiform or oblong-lanceolate; spadix shorter than the spathe, the pistillate portion cylindric, densely many-flowered, narrowed upward, the sterile staminate part longer than the pistillate, narrowed above, the fertile staminate portion thick-cylindric, slightly narrowed upward, twice as long as the pistillate portion or longer; flowers unisexual, naked; stamens 4–6, connate to form a truncate-obpyramidal, 5- or 6-angulate synandrium truncate at its apex; anther cells obversely oblong-triangular or oblong, opening below the apex of the connective by a short slit; ovaries ovoid, coherent by the thickened, annuliform styles, 2- to 4-celled; ovules several or numerous, anatropous; stigma discoid or hemispheric-discoid, 3- or 4-lobate; berries cylindroid, crowned by the impressed stigma, 3- or 4-celled, the cells many-seeded; seeds ovoid, shorter than the funicles, the testa sulcate.

The genus includes about 40 species, all American. Seven have been reported from Central America.

a. Leaves pedatisect ..... 1. X. HELLEBORIFOLIUM
aa. Leaves entire.
b. Leaves glabrous ..... 2. X. VIOLACEUM
bb. Leaves pubescent.
c. Basal lobes of the leaf blade rounded, directed downward, separated by a relatively narrow sinus ..... 3. X. PILOSUM
cc. Basal lobes of the leaf blade triangular, directed outward, separated by a very broad and open sinus ..... 4. X. MEXICANUM

1. XANTHOSOMA HELLEBORIFOLIUM (Jacq.) Schott, Oesterr. Bot. Zeitschr. 6:33. 1856.

Arum helleborifolium Jacq. Icon. 3:*pl. 613*. 1786-93.
Acontias helleborifolius (Jacq.) Schott, Melet. 19. 1832.
Xanthosoma helleborifolium (Jacq.) Schott var. *viride* Engler in Mart. Fl. Bras. 3^2:198. 1878.

Caudex tuberous, hypogean; petioles stout and succulent, 20–40 cm. long or more, vaginate for 4–5 cm., glabrous; blades glabrous, thin, green, 20–30 cm. wide and 10–15 cm. long or larger, reniform in outline, pedatisect, the segments 5–13, distant, the lateral ones asymmetric, oblong or lanceolate, acuminate, cuneately narrowed to the base, the central segment oblong, acute, the rachis naked between the segments; peduncles slender, 10–15 cm. long; tube of the

Fig. 86. *Xanthósoma helleborifolium*

spathe green, ovoid, 3–4 cm. long, the blade oblong, cuspidate, 6–10 cm. long, yellowish green; pistillate portion of the spadix 2 cm. long, the fertile staminate about 6 cm., the sterile staminate about 5 cm.; ovaries short-ovoid, whitish.

Wet, lowland forests, Costa Rica to the Lesser Antilles, Guianas, and Amazonian Peru.

CANAL ZONE: Río Pequeni, *Woodson, Allen & Seibert 1606;* Barro Colorado Island, *Shattuck 133; Peggy White 148; Bailey 157.*

The plant is easy of recognition because of the combination of terrestrial habit and pedately compound leaves. It is reported that a decoction of the foliage of this and other plants is employed locally as one of the numerous remedies for snake bites.

2. XANTHOSOMA VIOLACEUM Schott, Oesterr. Bot. Wochenbl. 3:370. 1853.

Rhizome large and tuberous, hypogean; petioles 30–70 cm. long, 1–4 cm. broad at the base, long-vaginate, brownish violaceous; blades at first somewhat pruinose, becoming green, paler beneath, sagittate-ovate, 20–50 cm. long and 15–45 cm. wide or larger, shortly acuminate-apiculate, the basal lobes somewhat triangular, obtuse, separated by an open, acute sinus, the nerves and costa violaceous; peduncles 15–20 cm. long; tube of the spathe as much as 10 cm. long and 4 cm. broad, oblong, glaucous outside, pale yellowish within, the blade oblong-lanceolate, pale yellowish, 15–20 cm. long, 6–7 cm. wide; pistillate portion of the spadix whitish, 4 cm. long, 2 cm. thick, the fertile staminate portion 15 cm. long, the sterile part 4 cm. long; ovaries short-ovoid.

Cultivated commonly in tropical America, Africa, and Asia. Native of tropical America, but the original habitat unknown. Often escaping from cultivation and becoming naturalized, as in Panama.

PANAMÁ: Juan Franco Race Track, *Standley 27681;* Río Tapia, *Standley 28113;* Taboga Island, *Standley 27875.*

Local names are *Otó, Badu,* and *Coco,* the last two Jamaican. The plant is cultivated locally for its edible roots which are prepared for the table much like potatoes. Illustrated, Mart. Fl. Bras. 3^2:*pl. 43.*

Fig. 87. *Xanthosoma pilosum*

3. XANTHOSOMA PILOSUM C. Koch, Ind. Sem. Hort. Berol. App. 2. 1855.

Plants small and slender, the small, hypogean, tuberous rhizome only about 2.5 cm. in diameter; petioles slender, 15–20 cm. long, densely short-villous; cataphylls numerous and conspicuous, half as long as the petioles or longer, subulate-attenuate, short-villous; blades sagittate-ovate or cordate-ovate, thin,

copiously short-villous or puberulent, especially beneath, 18–30 cm. long, 11–16 cm. wide, cuspidate-acuminate, the basal lobes directed downward, rounded, separated by a narrow, oblong sinus; peduncles slender, 20–25 cm. long, villous; spathe puberulent outside, the tube 4–5 cm. long, the blade ovate-lanceolate or oblong-lanceolate, cuspidate-acuminate, yellowish white, 6–9 cm. long, 2–5 cm. wide; spadix slightly shorter than the spathe, the pistillate portion about 1.5 cm. long, the fertile staminate part 7 cm. long or less, pale yellowish; ovaries short-cylindroid.

Wet, lowland forests, Costa Rica to Colombia; in Colombia reported as ascending to 1,500 meters.

CANAL ZONE: between Gamboa and Cruces, *Pittier 3774*. COCLÉ: in bog, El Valle de Antón, 500–700 m., *Seibert 491*. CHIRIQUÍ: Puerto Armuelles, *Davidson 1083*.

4. XANTHOSOMA MEXICANUM Liebm. Vid. Medd. Naturh. For. 15. 1850.

Plants rather small and slender, arising from a small, hypogean caudex; petioles long and slender, puberulent or short-villous; blades deep green and glabrous above, puberulent beneath, broadly sagittate-triangular, 20–30 cm. long, 15–25 cm. wide near the base, cuspidate-acuminate, the basal lobes somewhat triangular, narrowed to an obtuse apex, separated by a very broad and open sinus; peduncles slender, 15–35 cm. long, pilose; tube of the spathe green and purple, 6 cm. long, 2 cm. broad, oblong, pubescent, the limb lanceolate, acuminate, white, pubescent outside, 10–12 cm. long, 4.5–5 cm. wide, cuspidate-acuminate; spadix somewhat shorter than the spathe, the staminate portion slender, about 8 cm. long.

In humid, lowland forest, Panama to southern Mexico.

CANAL ZONE: Barro Colorado Island, *Starry 271*. PANAMÁ: Taboga Island, *Woodson, Allen & Seibert 1521*.

The species has not been reported previously south of Mexico, having been confused locally with X *pilosum*, which it much resembles. The specimens, however, seem to represent a distinct species, and agree perfectly with a photograph of the type of X. *mexicanum*.

9. DIEFFENBACHIA Schott

DIEFFENBACHIA Schott, Wien. Zeitschr. Kunst 3:820. 1829.

Plants low or rather tall, terrestrial, the caudices thick, often elongate, prostrate, and rooting, the sap milky; petioles long, vaginate to the middle or higher, terete above; blades oblong, very thick and fleshy when living, the costa thick, disappearing toward the apex of the blade, the primary lateral nerves numerous, ascending, arcuate toward the margin, not united into a collective nerve; peduncles shorter than the leaves, the spathe oblong, persistent, the lower portion convolute, open at the throat and expanded into a spreading or recurved limb; spadix erect, slightly shorter than the spathe, often stipitiform at the base and adnate to the spathe, the pistillate portion of the spadix remotely many-flowered, the staminate part subcylindric, densely many-flowered, separated from the pistil-

late by an almost naked interval; flowers unisexual, naked; staminate flowers with 4 stamens, these connate to form a sessile, thick, 4- or 5-sulcate synandrium truncate at the apex; anthers contiguous, the cells obovoid, opening by an apical slit; pistillate flowers with 4–5 claviform staminodia, these rounded at the thickened apex, longer than the ovary, spreading; pistil 2- or 3-carpellate, sessile, depressed-ovoid, 2- or 3-lobate, 2- or 3-celled, sometimes 1-carpellate; ovules 1 in each cell, erect, anatropous; style none, the stigma 2- or 3-lobate, concave in the middle, the lobes thick; fruit baccate, 2- or 3-lobate or globose, crowned by the remnants of the stigma, 1- to 3-celled, the cells 1-seeded; seeds globose or ovoid, the testa thick, smooth; endosperm none.

The group consists of about 27 species, in Central and South America, six of them reported from Central America. The plants grow chiefly in damp or often very wet forest, where they sometimes form large, dense stands. When cut or crushed, they emit a strong, mephitic odor. The milky or yellowish sap is abundant, and is reported everywhere to cause serious irritation if it comes into contact with the skin. In the forest one often finds scattered plants whose normally green leaves are blotched with white or pale yellow. Such plants, as well as the normal green-leaved ones, have been introduced into cultivation in the North, and are sometimes seen as house plants. To such greenhouse plants the name "Mother-in-law Plant" has sometimes been given in the United States, an allusion to the fact that if a piece of the leaf is chewed (a rather dangerous experiment), sensation in the tongue is destroyed temporarily, sometimes with loss of the power of speech. The ripe fruits of all or most species are bright red at maturity, suggesting those of the "Jack-in-the-pulpit" *(Arisaema)* of the United States, a member of the same family. About the Canal Zone the Dieffenbachias are called *Otó de Lagarto,* and by the West Indians "Dumb Cane," the derivation of the latter being similar to that of "Mother-in-law Plant."

a. Sheath of the petiole extending almost to the base of the leaf blade. Spathe green ..... 1. D. PITTIERI
aa. Sheath of the petiole ending far below the base of the leaf blade.
b. Spathes green, about 30 cm. long ..... 2. D. LONGISPATHA
bb. Spathes yellow or orange at maturity, mostly less than 20 cm. long.
c. Leaf blades rounded at the base, the primary lateral nerves 6–9 on each side ..... 3. D. OERSTEDII
cc. Leaf blades cordate at the base, the primary lateral nerves about 18 on each side ..... 4. D. AURANTIACA

1. DIEFFENBACHIA PITTIERI Engler & Krause, Pflanzenreich IV. 23Dc:42. 1915.

Caudex thick; petioles fleshy, 10–13 cm. long, the sheath thin-coriaceous, persistent, 10–12 mm. wide on each side, slightly narrowed above and rounded at its apex, produced almost to the base of the blade; blades rather thick when dried, obliquely lance-oblong, 18–22 cm. long, 6.5–8 cm. wide, short-acuminate, obtuse or subacute at the base, the primary lateral nerves about 8–10 on each side, very oblique, rather prominent beneath; peduncles terete, 4–5 cm. long; spathes thin and subherbaceous when dried, 20 cm. long or more, the lowest portion 1.5 cm. thick, the limb oblong-lanceolate, cuspidate-acuminate, about 8 cm. long and 3–4

cm. wide; spadix adnate for half its length to the spathe, the lowest part naked, the staminate and pistillate portions separated by a sterile or naked interval 3 cm. long, the staminate portion of the spadix 6–7 cm. long, densely flowered; ovaries depressed-ovoid, 2–2.5 mm. in diameter; synandria 2–2.5 mm. in diameter.

Endemic in Panama.

CANAL ZONE: along trail between Gamboa and Las Cruces, 50–80 m., *Pittier 3766* (U. S. Nat. Herb., TYPE). COCLÉ: El Valle, 800–1000 m., *Alston & Allen 1839*.

The species is easy of recognition because of the form of the sheaths.

2. DIEFFENBACHIA LONGISPATHA Engler & Krause, Pflanzenreich IV. 23Dc:44. 1915.

Caudex often elongate and prostrate, as much as 10 cm. or even more in diameter, erect at the apex and bearing several large leaves; petioles succulent, 35–40 cm. long, the sheath broad, persistent, ending 1.5–5 cm. below the base of the blade; blades rather thin when dried but thick and succulent when living, mostly oblong-elliptic, short-acuminate or rounded and apiculate at the apex, more or less oblique and acute to almost rounded at the base, 30–60 cm. long and 18–30 cm. wide or even larger, the primary lateral nerves 20–22 on each side, divergent at an angle of 45–60 degrees; peduncles 20–25 cm. long, 1 cm. thick; spathe large, coriaceous, 30 cm. long or more, orange or yellow, the convolute portion 20 cm. long, the limb oblong, 4 cm. wide; lowest part of the spadix naked, the pistillate remotely few-flowered, reaching to the middle of the spathe or higher, the staminate part of the spadix separated from the pistillate by a sterile interval; ovary broadly depressed, 4–5 mm. in diameter, the staminodia linear, 5 mm. long.

Wet or swampy woods, lowlands of Panama.

COLÓN: Fató (Nombre de Dios), on marshy, alluvial flats, *Pittier 3838* (TYPE). PANAMÁ: Río Tapia, *Standley 28156, 26238*. CANAL ZONE: Fort Randolph, *Standley 28732;* hills between Río Grande and Pedro Vidal, 50–150 m., *Pittier 2715*.

This species is noteworthy for its unusually large leaves and spathes, which in size exceed those of all other Central American species.

3. DIEFFENBACHIA OERSTEDII Schott, Oesterr. Bot. Zeitschr. 8:179. 1858.

Caudex usually erect, sometimes decumbent, as much as a meter high, and often very thick; petioles 12–20 cm. long, succulent, slender and terete above the sheath, the sheath about two-thirds as long as the petiole; blades oblong-ovate, thin when dried but succulent in the living state, 12–30 cm. long, 6–14 cm. wide, short-cuspidate or short-acuminate, rounded or truncate at the base, the primary lateral nerves slender, 6–9 on each side; peduncles slender, 8–11 cm. long; spathes yellow or orange at maturity, about 15 cm. long and 3–4 cm. wide, lance-oblong; lower part of the spadix naked, the pistillate portion 5 cm. long, the staminate of the same length, fusiform, 10–12 mm. thick at the middle, the two separated by a sterile interval of 2 cm.; berries bright red.

Damp or wet forest, Panama to Guatemala; in Panama at or near sea level.

CANAL ZONE: Barro Colorado Island, *Standley 31266, 40960, 41107; Kenoyer 188; Maxon 6812, 6820;* Gamboa, *Pittier 2600;* Frijoles, *Pittier 3754;* above East Paraíso, *Standley 29867.* COLÓN: Loma de la Gloria, near Fató, *Pittier 3847.* CHIRIQUÍ: near David, *Pittier 2836.* BOCAS DEL TORO: Cocoa Cay, Chiriquí Lagoon, *Wedel 2892.*

4. DIEFFENBACHIA AURANTIACA Engler, Bot. Jahrb. 26:566. 1899.

Plants coarse and stout, about a meter high, with a thick, erect caudex; petioles half as long as the blades or often much shorter, thick and succulent, vaginate to above the middle and often almost to the base of the blade; blades often spotted with white or pale yellow, oblong to oblong-ovate, 25–40 cm. long and 9–20 cm. wide or larger, acuminate, shallowly and broadly cordate at the base, the primary lateral nerves usually 12–18 on each side, the lowest divergent at almost a right angle; inflorescences numerous, the slender peduncles mostly 4–7 cm. long; spathes pale yellow to orange or greenish yellow, 14–25 cm. long, at the base 1.2–3.5 cm. broad, gradually long-attenuate; pistillate portion of the spadix in fruit as much as 18 cm. long; berries orange-red at maturity, numerous and densely crowded, subglobose.

Usually in dense, wet forest at or near sea level, Costa Rica and Panama.

CANAL ZONE: hills north of Frijoles, *Standley 27413;* between Frijoles and Monte Lirio, *Killip 12154;* lake shore along Gatún River, *Pittier 6845;* Barro Colorado Island, *Bailey 335.* BOCAS DEL TORO: Río Cricamola, between Finca St. Louis and Konkintoë, *Woodson, Allen & Seibert 1909;* Water Valley, Chiriquí Lagoon, *Wedel 1438.* CHIRIQUÍ: Puerto Armuelles, *Woodson & Schery 861.*

10. RHODOSPATHA Poepp.

RHODOSPATHA Poepp. in Poepp. & Endl. Nov. Gen. Sp. 3:91. 1845.

Plants epiphytic, more or less scandent and rooting at the nodes; leaves distichous, the petiole about equaling the blade, long-vaginate, geniculate below the base of the blade; blades oblong to oblong-elliptic, slightly unequal at the base, the primary and secondary lateral nerves numerous, slender, subparallel, spreading or acutely ascending, arcuate near the margin; peduncles much shorter than the leaves, the spathe broadly ovate or oblong-ovate, abruptly cuspidate, longitudinally nerved, greenish outside, white or pink within, soon deciduous; spadix stipitate or sessile, cylindric, densely many-flowered, sometimes with only pistillate flowers at the base, but most of the flowers perfect; flowers naked, the stamens 4, the filaments rather broad, complanate, narrowed to the slender, acuminate connective; anthers rather broad, the cells elliptic, longer than the connective, dehiscent by lateral slits; ovary 4-angled, 2-celled, the ovules several or numerous in each cell, amphitropous; style thicker than the ovary, the stigma linear or rarely 2- or 3-lobate; berries small, cylindric-prismatic, truncate, 10- to 12-seeded; seeds attached by short funicles, vertically imbricate, rounded-reniform, lentiform, the testa minutely verruculose.

A genus of a dozen species, widely dispersed in tropical America. Four species are recorded from Central America.

1. RHODOSPATHA FORGETI N. E. Brown, Kew Bull. 358. 1913.

Caudex scandent; petioles slender, 30–35 cm. long, narrowly vaginate to the node, the margins of the sheath entire; blades oblong-lanceolate, commonly 40–50 cm. long and 11–15 cm. wide, cuspidate-acuminate, cuneate at the base, thin, green above, somewhat paler beneath, the lateral nerves very numerous and slender, all subequal, ascending at an angle of about 45 degrees; peduncles 12–15 cm. long; spathe 13–15 cm. long, 9–10 cm. wide when expanded, broadly elliptic, pinkish white outside, dirty pink within, cuspidate-acuminate; spadix white, short-stipitate, 8–12 cm. long, becoming 1.5 cm. thick, obtuse, pale pinkish; ovaries 3 mm. long, 4- or 5-angulate; ovary cells many-ovulate.

Described from cultivated plants of Costa Rican origin. Known otherwise only from the Panama material cited here.

CANAL ZONE: Barro Colorado Island, *Standley 40959, 41143.* DARIÉN: Crest, Cana-Cuasi trail, Chepigana District, 1650 m., *M. E. & R. A. Terry 1553.*

I have seen no authentic representation of *R. Forgeti,* but the first collection cited agrees well with the original description. It is rather probable, however, that *R. Forgeti* is synonymous with the earlier *R. Wendlandii* Schott, also Costa Rican.

11. HOMALONEMA Schott

HOMALONEMA Schott, Melet. 20. 1832.

Plants terrestrial, the short caudex epigean or rarely hypogean; petioles usually longer than the blades, vaginate below, the blades membranaceous or herbaceous, glabrous or pubescent, commonly cordate or sagittate; peduncles several, shorter than the petioles; spathe usually greenish, convolute below, open above, persistent; spadix stipitate or sessile, slightly shorter than the spathe, the pistillate portion cylindroid, comprising half or less of the total length, the staminate portion contiguous with the pistillate; staminate flower with 2–4 or rarely 6 stamens, these short, truncate at the apex, the anther cells ovoid or oblong, equaling or longer than the filament, opening by an oval, apical pore; pistillate flowers 2- to 4- or rarely 5-gynous, the pistil ovoid to oblong or subglobose; ovary incompletely 2- to 4-celled, the ovules numerous; stigma sessile, discoid, orbicular or shallowly 2- to 4-lobate; berries obovoid to oblong or subglobose, incompletely 2- to 5-celled, the cells many-seeded; seeds attached by a long funicle, ellipsoid or elongate-ellipsoid, blackish brown, longitudinally striate.

The genus consists of about 80 species, chiefly in the Old World. The following is the only North American one.

1. HOMALONEMA WENDLANDII Schott, Prodr. Aroid. 308. 1860.

Plants rather large and robust, the caudex hypogean; petioles 40–50 cm. long, vaginate for a third their length, terete above and 4–5 mm. thick, densely puberulent; blades dark green above, reddish-margined, paler beneath, sagittate or cordate-sagittate, 30–50 cm. long, 20–30 cm. wide, acute or short-acuminate, glabrous above, puberulent beneath, at least on the nerves, the basal lobes semi-ovate or subtriangular, separated by a broad or narrow sinus, the costal lateral

nerves 10–14 on each side, curved near the margin; peduncles 5–10 cm. long, densely puberulent, almost 1 cm. thick; spathe brownish outside, spotted with yellow, whitish within, the lower convolute portion 8 cm. long and 4 cm. broad, the blade 15 cm. long, 6–7 cm. wide, with a cusp 2.5–3 cm. long; spadix sessile, the pistillate portion 5 cm. long, 2 cm. thick, green, the staminate part subconoid, 12 cm. long, 1.5 cm. thick at the base, gradually attenuate to the apex; staminate flowers with 5 stamens; pistil ovoid, subtetragonous, the stigma shallowly 4-lobate; fruiting inflorescence 10 cm. long or more and 5 cm. thick; berries 12 mm. long, 5 mm. thick.

Described from plants of Costa Rican origin cultivated in Berlin; lowland forests of Panama.

CANAL ZONE: Matachín, *Cowell 203*; Barro Colorado Island, *Kenoyer 189*.

The plant is easy of recognition because of its combination of terrestrial habit and pubescent blades, petioles, and peduncles.

12. ANEPSIAS Schott

ANEPSIAS Schott, Gen. Aroid. *pl. 73*. 1858.

Large, scandent epiphytes, the leaves distichous; petioles long, vaginate almost to the apex, the sheath persistent, adnate for its whole length; blades obliquely ovate-oblong, very large, thin when dried, the primary lateral nerves numerous, spreading, the secondary nerves parallel with them, the veins reticulate; inflorescence terminal, solitary, the peduncle much shorter than the petiole, stipitiform above the base of the spathe; spathe oblong, acuminate, convolute, deciduous in fruit; spadix long and slender, slightly shorter than the spathe, very densely many-flowered; flowers perfect, naked; stamens 4, the filaments short, complanate, abruptly narrowed at the apex to the slender, acuminate connective; anthers shorter than the filaments, the cells elliptic, exceeding the connective, apiculate, dehiscent by elongate, lateral slits extending to the base of the anther; ovary obpyramidal, prismatic, truncate, 2- to 6-celled; ovules numerous in the cell, anatropous, erect or spreading, 2- to 6-seriate; style as thick as the ovary, the stigma linear.

The genus consists of a single species.

1. ANEPSIAS MORITZIANUS Schott, Gen. Aroid. *pl. 73*. 1858.

A large, epiphytic vine, the caudex rooting at the nodes, the internodes 1 cm. long and thick; petioles 30–40 cm. long or more, 2–2.5 cm. broad at the base, slender above; blades 30–65 cm. long and 15–30 cm. wide or even larger, abruptly short-acuminate, rounded and abruptly short-decurrent at the base or cuneately acute, the primary lateral nerves about 20 on each side, very slender but prominent beneath; peduncles about 15 cm. long, rather stout, the spathe 15–19 cm. long, 6–7 cm. wide; spadix 13–18 cm. long, borne on a stipe 1 cm. long, 1–1.5 cm. thick near the base, very slightly narrowed to the obtuse apex, white at maturity; ovaries scarcely 3 mm. long and 1 mm. thick.

Originally described from rain forests of Tovar, Venezuela, and known otherwise, apparently, only from Santa María de Dota, Costa Rica, and Panama.

CANAL ZONE: Barro Colorado Island, *Standley 31462; Aviles 36;* between Frijoles and Monte Lirio, in forest, *Killip 12153.* CHIRIQUÍ: vicinity of San Bartolomé, Península de Burica, *Woodson & Schery 929.*

13. STENOSPERMATION Schott

STENOSPERMATION Schott, Gen. Aroid. 70. 1858.

Plants epiphytic, rooting at the nodes and more or less scandent, densely leafy, the leaves distichous; petioles long-vaginate, geniculate below the base of the blade; blades oblong-elliptic or lanceolate, unequal-sided, rather coriaceous when dried, very succulent when living, the primary lateral nerves numerous, obliquely ascending; peduncles rather long, nutant at first at the apex, later erect; spathe convolute, open in anthesis, whitish, soon deciduous; spadix sessile or stipitate, cylindric, whitish; flowers perfect and fertile, naked; stamens 4, the filaments complanate, abruptly narrowed at the apex into the slender connective, equaling the ovary; anther cells oblong-ovoid, acute, dehiscent by lateral slits that do not reach the base of the cell; ovary obpyramidal or prismatic, truncate at the apex, 2-celled; ovules 4 or more in each cell, collateral, anatropous; style short, thicker than the ovary, the stigma linear-oblong; fruits small, baccate, obovoid, subtruncate at the apex, 2-celled, each cell with 3 or more seeds; seeds clavate-cylindric, slender, with a rather thick testa; endosperm copious.

Fig. 88. *Stenospermation sessile*

A genus of about 20 species in tropical America. Six species are recorded for Central America.

a. Spadix sessile ..... 1. S. SESSILE
aa. Spadix conspicuously stipitate ..... 2. S. SPRUCEANUM

1. STENOSPERMATION SESSILE Engler, Bot. Jahrb. 37:111. 1905.

A small or large vine, almost frutescent, the caudex commonly 1 cm. thick, sometimes as much as 2 cm., the internodes short; petioles 6–25 cm. long, the

sheath broad at the base, narrowed upward, ending 1–3 cm. below the base of the blade; blades oblong or lance-oblong, mostly 13–18 cm. long and 3–5 cm. wide, acuminate or long-acuminate, acute at the base; peduncles slender, 12–30 cm. long; spathe oblong, short-acuminate, white, about 4 cm. long, 1 cm. wide, early deciduous; spadix sessile, cylindric, obtuse, 2.5–3.5 cm. long, 5–8 mm. thick, pale green or yellow.

Costa Rica and Panama, epiphytic on trees in dense forests, usually at or near sea level.

CANAL ZONE: Balboa, cultivated, *Standley 28548;* Barro Colorado Island, *Standley 41147;* Río Indio de Gatún, *Pittier 5735;* Quebrada López, *Allen 2140.* COCLÉ: hills north of El Valle de Antón, 1000 m., *Allen 2198.* BOCAS DEL TORO: Little Bocas, *Wedel 2536.*

In Panama this species probably is confined to the Atlantic lowlands, but it may well be expected in the mountains of Chiriquí, since in Costa Rica it ascends to 1,600 meters and higher. The plant may be recognized by the rather thick and flexible-leathery (when dried) leaves, with very numerous but obscure, oblique nerves. Noteworthy also for the short, very blunt spadix, and the deciduous spathe. Illustrated, Engler, Pflanzenreich IV. 23B: *fig. 34, J-M.*

2. STENOSPERMATION SPRUCEANUM Schott, Gen. Aroid. 70, *fig. 1-14.* 1858.

Caudex elongate, as thick as a finger, the internodes 5–10 mm. long; petioles of the lower leaves 8–25 cm. long, vaginate almost to the apex; blades coriaceous, oblong-elliptic or oblong-lanceolate, 15–26 cm. long, 5–7 cm. wide, subacuminate to very obtuse and apiculate at the apex, the primary lateral nerves about 20 on each side, ascending at a very narrow angle; peduncles slender, 18–30 cm. long; spathe ovate-oblong, acuminate, 8–11 cm. long, pale green; spadix borne on a stipe 5 mm. long, cylindric, very obtuse, 3.5–4 cm. long, 7–8 mm. thick; pistils short-turbinate, 1 mm. long and broad, tetragonous at the apex.

Wet forest, Panama to Colombia, British Guiana, and Amazonian Peru.

DARIÉN: Cerro de Garagará, Sambú Basin, 500–970 m., *Pittier 5674.* COCLÉ: hills north of El Valle de Antón, 1000 m., *Allen 2197.*

The first collection cited was determined by Engler and Krause as perhaps referable to this species. It agrees well enough with South American material, and probably can be referred permanently to *S. Spruceanum.*

14. SYNGONIUM Schott

SYNGONIUM Schott, Wien. Zeitschr. Kunst 3:780. 1829.

Scandent epiphytes, the caudices often greatly elongate, the internodes mostly long, the nodes emitting roots; earliest leaves ovate, the next sagittate, the adult ones trisect or pedatisect; petioles long, terete above, rather long-vaginate; blades varying from trisect to pedately 5- to 9-cleft, the primary lateral nerves of the segments spreading, forming 1–3 collective nerves; peduncles usually clustered, equaling or shorter than the spathe, pendent or recurved in fruit; spathes pale or yellowish green, rarely purplish, in fruit often turning bright red, the tube ovoid,

slightly exceeding the pistillate inflorescence, the limb oblong-ovate, erect-spreading and open at anthesis, usually deciduous in fruit; spadix much shorter than the spathe, the pistillate inflorescence oblong-conoid, the staminate portion of the spadix longer than the pistillate, clavate, sterile at the base; flowers unisexual, naked; staminate flowers with 3–4 stamens, these connate to form a truncate-obpyramidal, 3- or 4-sided synandrium; connective of the anthers thick, the cells rounded or obtuse at the base, dehiscent below the apex of the connective by a short slit; pistillate flowers connate, the ovary obovoid or oblong-obovoid, normally 2-celled, by abortion sometimes 1-celled; ovules 1 in each cell, erect, anatropous; stigma convex or hemispheric, sometimes 2- or 3-emarginate; fruits baccate, connate into an ovoid syncarp; seed obovoid, borne on a very short funicle, the testa smooth, thin, black; endosperm none.

A genus of about 15 species, confined to tropical America. Seven species are known from Central America.

a. Adult leaves trisect ..... 1. S. HOFFMANNII
aa. Adult leaves 5- to 11-cleft ..... 2. S. PODOPHYLLUM

1. SYNGONIUM HOFFMANNII Schott, Oesterr. Bot. Zeitschr. 8:178. 1858.
Porphyrospatha Hoffmannii (Schott) Engler in DC. Monogr. Phan. 2:291. 1879.

Fig. 89. *Syngonium Hoffmannii*

Probably a large vine; petioles very slender, 20–30 cm. long, the narrow sheath 13–18 cm. long, adnate for its whole length; blades trisect, the middle segment ovate-oblong to elliptic, 15–18 cm. long, 6–11 cm. wide, acuminate, cuneately narrowed to the sessile base, the primary lateral nerves 5–6 on each side, united to form a collective nerve rather remote from the margin, the lateral segments oblong or obliquely ovate, slightly smaller than the middle one, sometimes subauriculate on the outer side, short-petiolulate; peduncles slender, about 7 cm. long, recurved; spathe subcoriaceous, whitish outside, turning orange, pale purple within, the tube oblong-ovoid, 4.5–8 cm. long, adnate to the stipe, the blade ovate-oblong, 7–8 cm. long, 6 cm. wide, caudate-acuminate; spadix slightly more than half as long as the spathe, the pistillate portion 2.5 cm. long, 1.5 cm. thick, the staminate portion cylindric, very obtuse, 5 cm. long and almost 2 cm. thick at maturity; stamens 4, the synandria 1.5 mm. long; pistils obovoid, 1 mm. long, the stigma discoid, bilobate.

Forests of Costa Rica (described from Candelaria, near San José) and the Pacific slope of Panama.

CHIRIQUÍ: Río Chiriquí to Remedios, 15–50 m., *Woodson, Allen & Seibert 1189*; San Bartolomé, Península de Burica, *Woodson & Schery 930*.

2. SYNGONIUM PODOPHYLLUM Schott, Syn. Aroid. 68. 1856.

Syngonium salvadorense Schott, Oesterr. Bot. Zeitschr. 8:178. 1858.
Syngonium Oerstedianum Schott, Oesterr. Bot. Zeitschr. 8:178. 1858.

A large, epiphytic vine, the caudex 1–1.5 cm. thick, the internodes elongate; juvenile leaves long-petiolate, the blades sagittate, 13–15 cm. long, the basal lobes triangular or oblong-lanceolate, the terminal lobe acuminate; petioles of adult leaves 40–50 cm. long, vaginate for about half their length, the blades 5- to 11-cleft, the middle segment of the blade about 20 cm. long and 6–7 cm. wide, the next lateral segments slightly shorter and narrower, the outermost about 10 cm. long, often auriculate on the outer side, the segments separated by short or elongate internodes of the rachis; peduncles several, separated by linear-lanceolate, whitish cataphylls, about 10 cm. long; tube of the spathe 3–5 cm. long and 1.5–2 cm. thick, oblong-ovoid, the blade about 6 cm. long and 4–5 cm. wide, green outside, whitish or pink within, ovate, cuspidate; pistillate portion of the spadix 2 cm. long, green, the staminate 5 cm. long, 10–13 mm. thick, slightly attenuate to each end; ovaries depressed-obpyramidal, the stigma discoid, suborbicular.

Climbing over trees in wet forest, or often in exposed and rather dry places, Panama to southern Mexico.

CANAL ZONE: common in forests and doubtless general through the moist lowlands, or even extending well up into the mountains. BOCAS DEL TORO: Johns Creek, Chiriquí Lagoon, *Wedel 2765*; Darkland, Chiriquí Lagoon, *Wedel 2616*.

The mature fruiting spathes are usually bright red, and cause the plant to be even more conspicuous than it would otherwise be even with its unusual and decorative foliage. It is now rather frequent in cultivation in Florida and other warm parts of the United States, and has become popular also as a house plant, for its succulent leaves withstand well the trying conditions of steam-heated apartments. It has been discussed and illustrated recently by L. H. Bailey (Gentes Herb. 4:305-308. 1940). Illustrated also by Engler, Pflanzenreich IV. 23E:126. 1920.

15. PHILODENDRON Schott

PHILODENDRON Schott, Wien. Zeitschr. Kunst 3:780. 1829.

Plants usually epiphytic and scandent, the internodes mostly elongate, the nodes often emitting roots; petioles short or elongate, rarely geniculate near the apex, vaginate for part or all their length; blades herbaceous or more or less coriaceous, very variable in form, sometimes lobed or parted, the lateral nerves all parallel and equal, or the primary ones often stouter than the secondary; peduncles generally short; spathes succulent, mostly whitish, yellowish, or red, the tube convolute, cylindric or ventricose, persistent, the blade cymbiform, ovate to lanceolate, commonly erect and after fecundation reconvolute, persistent in fruit; spadix

almost equaling the spathe, sessile or short-stipitate, the pistillate portion cylindric, densely many-flowered, juicy in fruit, the staminate portion sterile below, fertile above for most of its length, finally drooping in fruit; flowers unisexual, naked; stamens of the staminate flower 2–6, sessile, obpyramidal-prismatic, truncate at the apex, the anther cells oblong or linear, emarginate at the base, opening by a short slit; ovary of the pistillate flower obovoid or ovoid, 2- to several-celled; ovules orthotropous or half-anatropous, ascending on rather long funicles, few or numerous; stigma sessile, hemispheric or sometimes lobulate; fruits baccate, densely crowded; seeds rather numerous, few, or only 1, ovoid-oblong or ellipsoid, straight, the testa rather thick, striate-costate; endosperm present.

The second-largest American genus of Araceae, with 200 or more species. They are distributed over most of tropical America, but are most numerous in the Andean region. About 28 species are known from Central America.

Plants of this genus constitute a large and conspicuous element of the epiphytic vegetation of the Panama lowlands. The leaves of many species are handsome and attractive. Various species of *Philodendron* may be seen commonly in northern greenhouses, and a few are cultivated as house plants.

a. Leaf blades lobed or variously parted.
  b. Leaves 3-parted, the segments oblong, entire ..... 1. P. TRIPARTITUM
  bb. Leaves pinnatifid, with numerous narrow lobes ..... 2. P. RADIATUM
aa. Leaf blades entire.
  b. Leaves deltoid-cordate, rounded-cordate, oblong-cordate, or sagittate-cordate, deeply cordate at the base, with a broad or narrow sinus and well-developed posterior lobes.
    c. Petioles glabrous.
      d. Basal sinus of the leaves very broad and open, much wider than long, the basal lobes slightly spreading outward. Blades large, mostly 30–50 cm. long or larger, the primary lateral nerves much stouter than the secondary ones ..... 3. P. PANAMENSE
      dd. Basal sinus of the leaves deep and narrow, normally much longer than broad, the basal lobes directed downward or even slightly inward.
        e. Primary lateral nerves of the leaves little or not at all stouter than the parallel secondary ones; blades large and thin, mostly more than 30 cm. long ..... 4. P. GRANDIPES
        ee. Primary lateral nerves of the leaves conspicuously stouter and more prominent than the secondary ones; blades mostly less than 25 cm. long.
          f. Leaves thin when dried, oblong-cordate; spathes 6–7.5 cm. long ..... 5. P. BREVISPATHUM
          ff. Leaves thick and rather coriaceous when dried, broadly cordate or rounded-cordate; spathes about 12 cm. long.
            g. Basal sinus broadly obtuse; primary lateral nerves of the leaves 4–5 on each side ..... 6. P. HOFFMANNII
            gg. Basal sinus acute; primary lateral nerves of the leaves about 10 on each side ..... 7. P. BRENESII
    cc. Petioles covered with long, soft, hair-like setae ..... 8. P. VERRUCOSUM
  bb. Leaves various in shape but never cordate or sagittate, acute to rounded at the base or, if shallowly cordate, oblong and without evident basal lobes.
    c. Leaf blades evidently cordate at the base or rarely rounded (in juvenile leaves), usually broadest above the middle ..... 9. P. WENDLANDII
    cc. Leaf brades truncate to acute at the base, broadest at or below the middle.
      d. Sheath of the petiole ending far below the base of the blade. Leaf blades elliptic-oblong, usually narrowed to the base, this

often subacute but sometimes broadly rounded ..... 10. P. KARSTENIANUM
dd. Sheath of the petiole extending nearly or quite to the base of the blade.
e. Primary lateral nerves of the leaves much stouter and more conspicuous than the secondary ones; leaf blades large, usually 25–35 cm. long or more ..... 11. P. COERULESCENS
ee. Primary lateral nerves of the leaves little stouter or more conspicuous than the secondary ones; leaf blades mostly 20 cm. long or less ..... 12. P. GUTTIFERUM

1. PHILODENDRON TRIPARTITUM (Jacq.) Schott, Melet. 1:19. 1832.

Arum tripartitum Jacq. Hort. Schoenbr. 2:33, *pl. 190.* 1797.

A small or large, epiphytic vine, the internodes elongate, 5–12 cm. long, 1–1.5 cm. thick; cataphylls elongate-lanceolate, caducous; petioles terete, commonly 20–30 cm. long and 1–1.5 cm. thick at the base; blades thin when dried, 3-parted, the segments oblong-lanceolate, acuminate or short-cuspidate, subequal, about 15–25 cm. long and 4–7 cm. wide, the lateral ones conspicuously oblique, all 3 segments sessile, almost or quite distinct; peduncles solitary, 3–7 cm. long, rather stout; spathe whitish, toward the apex often yellowish, the tube oblong, 3–4 cm. long, the blade ovate or ovate-oblong, short-acuminate, about 5–6 cm. long and 3 cm. wide; spadix borne on a stipe 2–4 cm. long, the pistillate portion 3–4 cm. long, 8–10 mm. thick, the staminate 3.5–5 cm. long, slightly attenuate upward; pistils cylindric, 1.5–1.8 mm. long, 7- to 11-celled, the cells 1- or 2-ovulate; berries red.

Climbing over trees, usually in wet forest, commonly at or near sea level, British Honduras and Guatemala to Jamaica, Venezuela, and Colombia. Originally described from Caracas, Venezuela.

CANAL ZONE: Frijoles, *Pittier 3755;* Barro Colorado Island, *Shattuck 182.* PANAMÁ: Juan Díaz, *Standley 30618.*

Pittier 5601 from Garagará, cited by Engler and Krause under this species (Pflanzenreich IV. 23Db:108. 1913), is rather *Anthurium garagaranum* Standl. Illustrated, Pflanzenreich IV. 23Db:108.

2. PHILODENDRON RADIATUM Schott, Oesterr. Bot. Wochenbl. 3:378. 1853.

A large, epiphytic vine, the caudex sometimes 12 cm. or even more in diameter, the lower internodes 10 cm. long, the upper ones 2–3 cm. long; cataphylls pale pink, linear-lanceolate; petioles terete, at least above, 40–65 cm. long, almost 2 cm. thick at the base; blades coriaceous when dried, very fleshy when growing, the earliest juvenile ones ovate-oblong and subentire, the later ones shallowly or deeply incised-lobate, the adult blades ovate-cordate in outline, 35–55 cm. long and 30–35 cm. wide or often much larger, with 5–10 segments on each side, these lanceolate to linear-lanceolate, often again lobate, acuminate, the middle segments 2–2.5 cm. wide, the basal ones much shorter and coherent; peduncles 4–5 cm. long; spathes about 20 cm. long, green outside or somewhat purplish, whitish and purplish within, cymbiform, the blade equaling or slightly longer than the tube; spadix 12–18 cm. long, the pistillate portion cylindric, the staminate terete-conoid, obtuse, slightly longer than the pistillate portion; pistils pale green, oblong, 2–3

mm. long, 8- to 10-celled, crowned by the rounded stigma, the cells 4- or 5-ovulate; stamens 4–6; berries oblong, 6–7 mm. in diameter.

Climbing over trees in moist or wet forest, southern Mexico to Panama, at or near sea level, or in some parts of Central America ascending to 700 meters.

CANAL ZONE: between Gorgona and Gatún, *Pittier 2300;* Barro Colorado Island, *Shattuck 266; Kenoyer 178a; Standley 31328, 40818;* near Fort Sherman, *Standley 30992;* near Fort Randolph, *Standley 28626;* near Gatún, *Standley 27203;* hills north of Frijoles, *Standley 27467.* BOCAS DEL TORO: Río Cricamola, between Finca St. Louis and Konkintoë, *Woodson, Allen & Seibert 1901.*

Local names are *Azota-cabeza* and *Chaldé. Pittier 2300* was reported by Engler and Krause (Pflanzenreich IV. 23Db:121. 1913) as *Philodendron Warscewiczii* C. Koch, a species of Guatemala and Salvador, evidently in error. Illustrated, Pflanzenreich IV. 23Db: *fig. 40.*

3. PHILODENDRON PANAMENSE Krause, Pflanzenreich IV. 23Db:65. 1913.

A large, epiphytic vine, doubtless with a thick caudex; petioles rather stout, terete, as much as 50 cm. long, at the base 1.5 cm. thick, attenuate upward; blades rather thick and coriaceous when dried, usually triangular-ovate-cordate, 30–50 cm. long and 25–30 cm. wide, or often much larger, almost obtuse at the apex and obliquely short-cuspidate, the basal lobes rounded or rounded-obtuse, often slightly spreading outward, separated by a rather shallow, very broad sinus, the primary costal nerves 6–7 on each side, divergent at a wide angle, much stouter than the secondary nerves; peduncles 12–15 cm. long, stout; spathe white or whitish, or in fruit red, the tube ovoid, 5 cm. long and 3 cm. broad, the blade oblong, as much as 8 cm. long, acute; spadix subsessile, the pistillate portion subovoid or ellipsoid, 5–7 cm. long, 2 cm. or more in diameter, the staminate portion cylindric, about as long as the pistillate, 12 mm. thick; pistils ovoid-oblong, 3–3.5 mm. long, 2 mm. broad, 5- or 6-celled, crowned by the orbicular stigma.

Climbing over trees in wet forest, at or near sea level, Panama; perhaps also in Costa Rica.

CANAL ZONE: Frijoles, *Pittier 3753* (TYPE); between Frijoles and Monte Lirio, *Killip 12133;* Barro Colorado Island, *Starry 47; Aviles 25, 46; L. H. & E. Z. Bailey 199; Kenoyer 184, 185;* Fort Randolph, *Standley 28728.*

The local name is reported as *Bejuco Lengua de Vaca. Aviles 46,* from Barro Colorado, consists of a single leaf, noteworthy for being oblong-hastate, with a rather narrowly oblong anterior division and large basal lobes. It is probably no more than a juvenile leaf form.

4. PHILODENDRON GRANDIPES Krause, Pflanzenreich IV. 23Db:48. 1913.

A scandent epiphyte, perhaps sometimes terrestrial and acaulescent or nearly so(?); petioles long and very slender, 40–65 cm. long; blades thin when dried and usually somewhat fuscous, rounded-ovate-cordate, 27–40 cm. long, 20–25 cm. wide, short-cuspidate, deeply cordate at the base, the basal lobes broadly rounded or obtusely angulate, directed downward, the sinus deep and narrow but open, the primary costal nerves about 10 on each side, divergent at a wide angle, con-

spicuously stouter than the secondary nerves but nevertheless very slender; peduncles terete, slender, 8–10 cm. long; spathe green, the tube 3 cm. long, 2.5 cm. thick, the limb ovate-oblong, short-acuminate, 4–4.5 cm. long, 2.5–3 cm. wide when expanded; spadix short-stipitate, the pistillate portion cylindric, 2.5 cm. long, almost 1 cm. thick, the staminate part subclavate, 4 cm. long, 8–10 mm. thick at the middle, attenuate to each end, acutish; pistils prismatic, 1.8 mm. long, 4- to 6-celled, capped by the rounded stigma; cells of the ovary many-ovulate.

Climbing over trees in wet forest, at or near sea level, Panama.

COLÓN: Dos Bocas, Río Fató valley, *Pittier 4228* (TYPE). CANAL ZONE: Barro Colorado Island, *Standley 31361, 40888*; hills north of Frijoles, *Standley 27471*; Gamboa, *Standley 28401*.

5. PHILODENDRON BREVISPATHUM Schott, Bonplandia 7:29. 1859.

Caudex with slender, elongate internodes; petioles subterete, 16–18 cm. long, short-vaginate; blades oblong-cordate, 20–27 cm. long, 6–12 cm. wide, acuminate, deeply cordate at the base, the basal lobes rather narrow, rounded, directed downward, the sinus deep and narrow, the primary costal nerves 5–6 on each side, much stouter and more prominent than the secondary ones; peduncles 1–2 cm. long; tube of the spathe globose-ventricose, 3 cm. long, the limb yellow, broadly ovate, cuspidulate-acuminate, equaling or slightly exceeding the tube; spadix borne on a stipe 3–4 mm. long, the pistillate portion 2–2.5 cm. long, the staminate part cylindric, attenuate upward, up to 6 cm. long, below about 1 cm. thick; pistils oblong, 6-celled, capped by the small, rounded stigma; stamens usually 4.

Known only from the original Panama material.

CANAL ZONE: Chagres, *Fendler 431*.

Of this I have seen only a single specimen of the original collection, in the U. S. National Herbarium, consisting of one leaf. The leaf bears much resemblance to those of *P. panamense*, but is not matched exactly by any specimens recently collected in Panama.

6. PHILODENDRON HOFFMANNII Schott, Oesterr. Bot. Zeitschr. 8:178. 1858.

A large, epiphytic vine, the caudex slender, its internodes elongate; petioles subterete, 12–16 cm. long or even longer; blades thick-coriaceous when dried, broadly ovate-cordate, mostly 18–24 cm. long and 14–16 cm. wide, acuminate or long-acuminate, the basal lobes broadly rounded, directed downward, the sinus deep but usually narrow and acute, the primary costal nerves 4–5 on each side, conspicuously stouter or more conspicuous than the secondary ones; peduncles 4–5 cm. long, or sometimes twice as long or more; spathes green, cream-colored, or white, the tube ovoid, 4–5 cm. long, the limb oblong, cuspidate-acuminate, 5 cm. long or even as much as 10 cm.; spadix sessile, cream-colored or white, pistillate portion 1.5–2 cm. long and of the same thickness, the staminate part 5–5.5 cm. long, 1 cm. thick above; pistils elongate, 4 mm. long, 1 mm. thick, capped by the orbicular, discoid stigma, 3-celled; ovules 2 in each cell; stamens commonly 4.

Climbing over trees in wet or moist forest, usually near sea level, but in Guatemala ascending to 1,100 meters or more, Panama to Guatemala.

CANAL ZONE: Barro Colorado Island, *Aviles 42; Shattuck 60;* Fort San Lorenzo, *Maxon 7001;* France Field, *Standley 30439.* COLÓN: Porto Bello, *Pittier 2424.* PANAMÁ: near Panamá, *Standley 26841;* Río Tapia, *Standley 28112.* BOCAS DEL TORO: Water Valley, Chiriquí Lagoon, *Wedel 1253, 2668.*

Here perhaps is referable Hemsley's report (Biol. Centr.-Amer. Bot. 3:421. 1885) of "*P. cuspidatum* K. Koch" from Panama, on the basis of a Wagner collection. *P. cuspidatum* C. Koch & Bouché is considered by Engler and Krause a variety of *P. scandens* Koch & Sello, a West Indian species, closely related to *P. oxycardium* Schott. The Panama specimens of this alliance, although fairly numerous, are not in good condition for critical study, most of them being sterile. *Pittier 2424* was referred by Engler and Krause doubtfully to *P. Hoffmannii.* The writer suspects that all the Panama material is perhaps better referable to *P. oxycardium* Schott. The local name of *Bejuco de Corazón* is reported for this plant.

7. PHILODENDRON BRENESII Standl. Field Mus. Bot. Ser. 18:140. 1937.

A large, epiphytic vine; petioles rather stout, subterete, 12–45 cm. long, vaginate below for 3–5 cm.; blades thick and almost subcoriaceous when dried, oblong-ovate to broadly ovate, 35–60 cm. long, 15–28 cm. wide, gradually and narrowly acuminate, deeply cordate at the base, with a rather narrow, acute sinus, the basal lobes 5–12 cm. long, rounded, directed downward, bright green and lustrous above, pale beneath and almost glaucescent, the costa thick and prominent, the primary lateral nerves about 10 on each side, slender, elevated, much stouter than the very numerous secondary nerves; spathe about 16 cm. long, 1.5 cm. thick at the base, green below, white above, the spadix of about the same length.

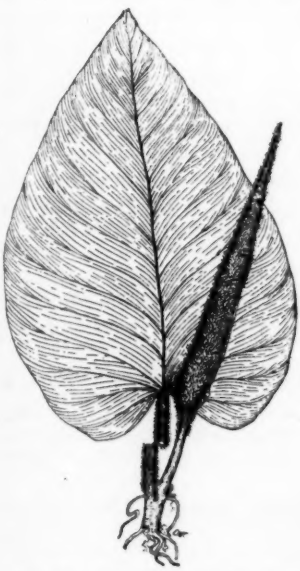

Fig. 90. *Philodendron verrucosum*

Scandent over trees in wet forest, at 1,000–1,700 meters, Costa Rica and Panama, the type from La Palma de San Ramón, Costa Rica.

CHIRIQUÍ: Callejón Seco, Volcán de Chiriquí, 1700 m., *Woodson & Schery 510.*

8. PHILODENDRON VERRUCOSUM Mathieu, Cat. 1854, ex Schott, Syn. Aroid. 85. 1856.

Plants usually terrestrial but said to be sometimes epiphytic, the caudex 2 cm. or less in diameter; cataphylls large, oblong, pink, obtuse, setose, 5–8 cm. long; petioles stout, terete or subangulate, 10–18 cm. long, dark red, cov-

ered everywhere with long soft scales or setae; blades herbaceous, broadly ovate-cordate, 15–45 cm. long, 10–30 cm. wide, acuminate, very deeply cordate at the base, with a narrow sinus, the lobes broadly rounded, glabrous, green above and usually with a metallic luster, somewhat paler beneath and often purplish, the primary lateral nerves 4–5 on each side; peduncles 10–20 cm. long, 1 cm. thick, densely setose; spathe 7–11 cm. long, densely setose outside, greenish outside, purplish or whitish within, acute; spadix sessile, the pistillate portion pale, oblong, 4–5 cm. long or in fruit as much as 7 cm. and 2–3 cm. thick, the staminate portion whitish, 6–7 cm. long; pistils cylindric, 4- or 5-celled; berries whitish or pale yellowish, narrowly cylindric, almost 1 cm. long.

Dense, wet forest, usually at 1,000 meters or less but in Costa Rica ascending sometimes to 1,400 meters, Costa Rica to Colombia.

BOCAS DEL TORO: Old Bank Island, Chiriquí Lagoon, *Wedel 1923;* Tsaki, 200 m., *Tonduz 9512* (fide Engler & Krause).

The leaves are handsome because of the deep, velvety green of the upper surface which often has a somewhat metallic sheen. Because of its handsome foliage, the species is sometimes cultivated in Europe, and probably also in hot-houses of the United States. Among all Central American Araceae it may be recognized at once by the densely setose petioles. Illustrated, Pflanzenreich IV. 23Db:75.

9. PHILODENDRON WENDLANDII Schott, Prodr. Aroid. 221. 1860.

A large or small, epiphytic vine, the caudex short or elongate, often 1 cm. or more in diameter, the internodes mostly elongate; petioles thick and succulent, 10–14 cm. long, semiterete; blades rather thick and subcoriaceous when dried, dark green, oblong or obovate-oblong, commonly 20–30 cm. long and 7–12 cm. wide but often larger, obtuse or rounded at the apex and cuspidate, shallowly cordate at the broad base, the sinus broad and open, often very shallow, the basal auricles broadly rounded, the primary nerves 7–10 on each side, widely spreading; peduncles short, stout, terete; spathes oblong-lanceolate, 14–18 cm. long, 5–7 cm. wide when expanded, white, short-acuminate, the tube equaling or slightly shorter than the limb; spadix subsessile, white, the pistillate portion cylindric, 4–5 cm. long, or in fruit to 7 cm. long and 1.5 cm. thick, the staminate part 6–8 cm. long, narrowed upward, very obtuse; pistils obovoid, 4- to 7-celled, capped by the small, orbicular stigma; berries red, subtetragonous-prismatic, 3 mm. long, 1.5 mm. thick; seeds ovoid, smooth, pale orange.

On trees in wet forest, lowlands of Panama and Costa Rica, at or near sea level.

CANAL ZONE: Río Indio de Gatún, *Pittier 2794;* Barro Colorado Island, *Aviles 89; Standley 31398; Shattuck 851;* hills north of Frijoles, *Standley 27598;* Balboa, cultivated, *Standley 28542.* COLÓN: Río Fató, *Pittier 3867.* BOCAS DEL TORO: Water Valley, Chiriquí Lagoon, *Wedel 1479.*

The local name is recorded as *Bejuco Deshinchador.* Illustrated, Pflanzenreich IV. 23Db: *fig. 9.*

10. PHILODENDRON KARSTENIANUM Schott, Syn. Aroid. 78. 1856.

A large or small, epiphytic vine, the caudex often 1 cm. or more in diameter, the internodes mostly 2–3 cm. long; petioles 10–20 cm. long, the sheath broad, green, persistent, rounded at the apex, ending 1 to several cm. below the base of the blade; blades thin when dried or somewhat coriaceous, narrowly elliptic-oblong to oblong-ovate, 15–30 cm. long, 7–13 cm. wide, rounded or obtuse at the apex and obliquely cuspidate, broadly rounded to short-cuneate at the base, the primary lateral nerves 7–8 on each side, divergent at a rather wide angle, all very slender or a few slightly more conspicuous than the others; peduncles 2–6 cm. long; spathes green, 6–14 cm. long, the tube ovoid or narrower, the limb whitish within, cuspidate, slightly shorter than the tube; spadix cylindric, borne on a stipe 5–8 mm. long, the pistillate portion 2–5 cm. long, the staminate 3–5 cm. long; pistils ovoid, 3- or 6-celled, crowned by the broadly discoid stigma, the ovules mostly 6-seriate; staminate flowers pale yellow, the stamens usually 3.

On trees in wet forest, usually near sea level, Panama to Venezuela and Ecuador.

CANAL ZONE: between Gorgona and Gatún, *Pittier 2262;* Gamboa, *Standley 28418;* near Gatún, *Standley 27224;* Barro Colorado Island, *Standley 31456, 40889; Wetmore & Woodworth 11.*

Illustrated, Pflanzenreich IV. 23Db: *fig. 3,* H-P.

11. PHILODENDRON COERULESCENS Engler, Bot. Jahrb. 26:523. 1899.

Usually a large, scandent epiphyte, the caudex often greatly elongate, branched, the internodes 3–4 cm. long or more, rather stout and up to 1.5 cm. or more in diameter; petioles 12–20 cm. long, the sheath green, usually narrow and often deciduous, extending nearly or quite to the base of the blade; blades commonly thick when dried, broadly ovate or elliptic-ovate, mostly 25–35 cm. long and 15–20 cm. wide, obliquely cuspidate-acuminate, truncate or broadly rounded at the base or almost subcordate, the primary lateral nerves 15–16 on each side, divergent at a wide, often almost right angle, conspicuously stouter and more prominent than the secondary ones, 1.5–2 cm. apart; peduncles short and stout; spathes green or whitish, 12–18 cm. long, cuspidate; spadix subsessile, pale, the pistillate portion cylindric, 2.5–4 cm. long, 1.5–2 cm. thick, the staminate elongate-cylindric, 8–10 cm. long, 1 cm. thick, obtuse; pistils elongate-cylindric, truncate, 2 mm. long, capped by the concave, orbicular stigma, 4- or 5-celled, the ovules numerous; stamens 3–4.

Panama and Colombia, climbing over trees in wet forest, at or near sea level.

CANAL ZONE: Balboa, *Standley 25609;* Barro Colorado Island, *Standley 31258, 41138; Kenoyer 180; Wetmore & Woodworth 17; Frost 238;* Río Chinilla, *Maxon 6891;* Mount Hope Cemetery, *Standley 28792;* Río Chagres above Alhajuela, *Pittier 3504;* Obispo, *Standley 31707.*

12. PHILODENDRON GUTTIFERUM Kunth, Enum. Pl. 3:51. 1841.
Philodendron rigidifolium Krause, Pflanzenreich IV. 23Db:7, *fig. 1,* G-M. 1913.
Philodendron calderense Krause, Pflanzenreich IV. 23Db:8. 1913.

A large or small, epiphytic vine, the caudex stout, often 1 cm. in diameter,

the internodes 1–2.5 cm. long, or the lower ones longer; petioles stout and succulent, 5–14 cm. long, the sheath broad, green, rounded at the apex, extending to the base of the blade, usually persistent; blades thinly coriaceous when dried, elliptic-oblong to broadly oblong or rounded-ovate, mostly 10–18 cm. long and 6–12 cm. wide, obtuse to rounded at the apex and abruptly cuspidate or cuspidate-acuminate, broadly rounded to subacute at the base, the primary lateral nerves

Fig. 91. *Philodendron guttiferum*

8–10 on each side, usually divergent at a wide angle but sometimes very oblique, scarcely stouter or more conspicuous than the secondary and tertiary ones; peduncles stout, 1–3 cm. long; spathes oblong, greenish or yellowish green, often cream-colored or white, 8–19 cm. long, the tube elongate, oblong, the limb open at anthesis, short-acuminate, coriaceous when dried; spadix sessile, cream-colored, cylindric, 10–16 cm. long, the pistillate portion about one-third as long as the staminate, the latter attenuate upward; pistils narrowly oblong, 4-celled, the ovules mostly 4-seriate; stamens 3–4.

On trees in wet forest, usually near sea level, Honduras to Panama and French Guiana.

CANAL ZONE: Barro Colorado Island, *Standley 40961; Wetmore & Woodworth 22;* hills north of Frijoles, *Standley 27477, 27545;* near Gatún, *Standley 27214.* COLÓN: Río Sirrí, Trinidad Basin, *Pittier 4013* (TYPE of *P. rigidifolium*). CHIRIQUÍ: forests around El Boquete, 1000–1300 m., *Pittier 3150* (TYPE of *P. calderense*); *Davidson 685.* BOCAS DEL TORO: Western River, Chiriquí Lagoon, *Wedel 2698;* Old Bank Island, Chiriquí Lagoon, *Wedel 1946.*

The name *Cinchadora* is said to be given in the Zone to this plant. After careful survey of the rather ample Central American material of this group now available for study, and after consideration of the characters upon which Krause's

two Panama species were based, it seems best to consider the three names cited as representing a single species, which also has as synonyms probably a number of other species considered distinct by Engler and Krause. Illustrated, Pflanzenreich IV. 23Db: *fig. 3, A-G.*

16. MONTRICHARDIA Crueger

MONTRICHARDIA Crueger, Bot. Zeit. 12:25. 1854.

Plants somewhat arborescent, the caudex erect, often very thick and solid, simple or sparsely branched, frequently supported by prop roots, sometimes covered with small prickles, leafy above; petioles vaginate to the middle or higher, clasping at the base, the sheath produced at the apex into a ligule; blades sagittate, the basal lobes shorter or longer than the anterior one, the primary nerves united to form a collective nerve close to the margin; peduncles usually solitary, shorter than the leaves; spathe large and thick, convolute below, open above, finally deciduous; spadix slightly shorter than the spathe, the pistillate portion cylindric, densely many-flowered, short, the staminate portion contiguous to the pistillate, very densely many-flowered; flowers monoecious, naked; staminate flowers with 3–6 stamens, these distinct, obpyramidal-prismatic, contiguous, truncate at the apex, the filaments obsolete; anthers subsessile, 2-celled, the cells oblong, acutish, dehiscent by a short apical slit; pistil of the pistillate flower subprismatic-obovoid, sessile, 1-celled; ovules 1–2, ascending, anatropous; style not sharply differentiated from the ovary, the stigma sessile, orbicular; fruit large, baccate, spongious, excavate at the apex and radiately costate, 1-celled and 1-seeded; seed obovoid, the testa smooth, brown; endosperm none.

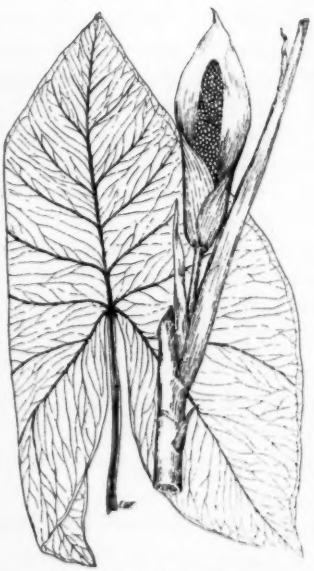

Fig. 92. *Montrichardia arborescens*

Two species are known, the other in Bahia, Brazil.

1. MONTRICHARDIA ARBORESCENS (L.) Schott, Arac. Betreff. 1:4. 1854.

Arum arborescens L. Sp. Pl. ed. 2. 371. 1763.
Montrichardia Fendleri Schott, Gen. Aroid. *pl. 40.* 1858.

Caudex usually 1–3 m. high and supported at the base by prop roots, 1.5–2 cm. thick or at the base much thicker, green, the internodes chiefly short and only 1 cm. long, often armed with recurved prickles 2–3 mm. long; petioles 20–30 cm. long or more, terete above, the sheath extending above the middle; blades 15–40 cm. long or more, deeply sagittate, the basal lobes retrorse, acuminate to subobtuse,

the anterior lobe triangular-ovate, broad, often cuspidate, the primary costal nerves 3–4 on each side; peduncle half as long as the spathe; spathes oblong-ovate, cuspidate, 10–15 cm. long and 6–7 cm. wide or larger, greenish or pale outside, white or whitish within; spadix very thick, the staminate portion 7 cm. long, the pistillate one-third as long; stamens 3–6; berries subglobose, 1–1.5 cm. in diameter.

In wet soil, most often in mud along the borders of tidal swamps or streams, British Honduras and Guatemala to Lesser Antilles and the Guianas.

CANAL ZONE and COLÓN: common in swamps of the Atlantic coast, and doubtless distributed along the whole coast.

Because of its peculiar habitat and characteristic leaf form, this plant is easy of recognition among other Panama aroids. The large, white spathes are conspicuous, and somewhat suggest those of the cultivated calla *(Zantedeschia)*. Illustrated, Standl. Fl. Pan. Canal Zone. *pl. 9*; Engler, Pflanzenreich IV. 23C:123. *Montrichardia Fendleri* was based on *Fendler 432* and *433* from Chagres.

LEMNACEAE

Plants very small or minute, oval, globular, or ensiform fronds (modified stems) free or variously attached, floating upon or beneath the surface of pools or sluggish streams, occasionally deposited on mud or wet rocks bordering a body of water. Roots present or absent. Inflorescence an extremely reduced spadix consisting of 1 pistillate and 1–2 staminate flowers, the whole immersed within a small pouch in the upper surface of the frond, naked or surrounded by an inconspicuous, vaginate spathe. Pistillate flowers naked, consisting of a single pistil containing 1 to several ovules. Staminate flowers naked, consisting of a single stamen.

The Lemnaceae include the Duck-weeds of the United States. They frequently occur in such great numbers that the whole surface of a pond may appear green, as though covered by a "water-bloom" of algae. For the determination of the Panamanian specimens cited in this account, the authors are indebted to Dr. W. H. Camp of the New York Botanical Garden. The text of the account is drawn largely from the works of C. H. Thompson (Ann. Rept. Missouri Bot. Gard. 7:101–111, *pl. 64–66.* 1896; *ibid.*, 9:21–42, *pl. 1–4.* 1898 [reprint, pp. 1–22. 1897]).

a. Fronds with solitary roots and 2 reproductive pouches ..... 1. LEMNA
aa. Fronds without roots and with 1 reproductive pouch.
  b. Fronds thin, ligulate ..... 2. WOLFFIELLA
  bb. Fronds thick, globular ..... 3. WOLFFIA

1. LEMNA L.

LEMNA L. Sp. Pl. 970. 1753; C. H. Thompson, Ann. Rept. Missouri Bot. Gard. 9:29. 1898 (reprint, p. 9. 1897).

Fronds attached by the basal margins, each bearing a solitary root; reproductive

pouches opening as clefts in either margin of the basal portion of the frond. Spadix of 1 pistillate and 2 staminate flowers, surrounded by an inconspicuous spathe.

a. Fronds thin, without papillae along the midrib; root-cap strongly curved, gradually tapering to a narrow rounded tip ..... 1. L. CYCLOSTASA
aa. Fronds thicker, with a row of papillae along the midrib; root-cap slightly curved, cylindrical, with a bluntly rounded tip ..... 2. L. MINIMA

1. LEMNA CYCLOSTASA (Ell.) Chev. Fl. Par. 2:256. 1827; Thompson, Ann. Rept. Missouri Bot. Gard. 9:35. 1898 (reprint, p. 15. 1897).

Lemna minor var.? *Cyclostasa* Ell. Sketch Bot. S. Car. & Ga. 2:518. 1824.
Lemna Valdiviana Phil. Linnaea 33:239. 1864.
Lemna Torreyi Aust. in Gray, Man. 479. 1867.
Lemna abbreviata Hglm. in Engl. Bot. Jahrb. 21:298. 1895.

Fronds solitary, or 2–8 attached in a more or less curved chain, oblong to obovate-oblong, usually somewhat falcate, 2.3–4.5 mm. long, 0.7–1.5 mm. broad, the base usually strongly asymmetrical, tapering into a short stipe or frequently sessile. Roots long, the cap strongly curved, tapering gradually to a small rounded tip.

Throughout the United States, southward into South America.

CHIRIQUÍ: rocky slopes of waterfall, Quebrada Velo, *Woodson & Schery 240;* in ditches, El Boquete, *Pittier 3046.* PANAMÁ: small pool, Juan Díaz, *Standley 30547.*

2. LEMNA MINIMA Phil. Linnaea 33:239. 1864; Thompson, Ann. Rept. Missouri Bot. Gard. 9:36. 1898 (reprint, p. 16. 1897).

Lemna platyclados Hglm. in Engl. Bot. Jahrb. 21:298. 1895.

Fronds solitary or adhering in groups of 2–4, oblong to elliptic, 3.9–1.5 mm. long, 0.9–2.7 mm. broad, bearing a row of minute papillae along the midrib. Roots slender, the cap slightly curved or straight, cylindrical, with a bluntly rounded tip.

Southern and western United States to South America.

CHIRIQUÍ: overflow of spring, Río Chiriquí Viejo valley, *Seibert 179.*

2. WOLFFIELLA Hglm.

WOLFFIELLA Hglm. in Engl. Bot. Jahrb. 21:303. 1895; Thompson, Ann. Rept. Missouri Bot. Gard. 9:37. 1898 (reprint, p. 17. 1897).

Fronds thin, ligular or ensiform, solitary or more frequently forming densely interwoven masses, without roots. Flowers and fruit unknown.

1. WOLFFIELLA LINGULATA Hglm. in Engl. Bot. Jahrb. 21:303. 1895; Thompson, Ann. Rept. Missouri Bot. Gard. 9:39. 1898 (reprint, p. 19. 1897).

Wolffia lingulata Hglm. Monogr. Lemnaç. 132. 1868.

Fronds solitary or rarely in pairs, ovate to oblong-lingulate, slightly asymmetrical, 2.7–6.6 mm. long, 1.7–3.0 mm. broad.

Southern California, Mexico, Panama.

CANAL ZONE: Río Chagres, *A. G. B. Fairchild 2099.*

3. WOLFFIA Hork.

WOLFFIA Horkel ex Schleid. Linnaea 13:389. 1839; Thompson, Ann. Rept. Missouri Bot. Gard. 9:39. 1898 (reprint, p. 19. 1897).

Fronds minute, thick, globular, without roots. Spadix of 1 staminate and 1 pistillate flower, bursting through the tissues of the upper surface of the frond, without a spathe.

1. WOLFFIA PAPULIFERA Thompson, Ann. Rept. Missouri Bot. Gard. 9:40. 1898 (reprint, p. 20. 1897).

Fronds slightly asymmetrical under magnification, obliquely ovoid, more or less flattened above, gibbous beneath, brown-punctate, 1.0–1.5 mm. long, about 1 mm. broad.

Central United States, Mexico, Panama.

CANAL ZONE: Río Chagres, *A. G. B. Fairchild 2099a.*

Dr. Camp writes of this specimen: "Incidentally, in *Fairchild 2099* [*Wolffiella lingulata*, vide supra] I found a single partly decomposed and much defunct specimen of what would seem to be *Wolffia papulifera* Thomps. I've been expecting this to bob up in Central America. I've seen it from Yucatan and collected it myself in Oaxaca. It's also abundant in certain areas in Michigan, S. Ohio and Kentucky. On your next trip try for a good collection to authenticate the species."

MAYACACEAE

1. MAYACA Aubl.

MAYACA Aubl. Hist. Pl. Guian. Fr. 1:42. 1775; A. C. Smith, N. Am. Fl. 19:1. 1937.

Slender moss-like herbs, the stems submerged or floating in fresh water, also growing in swamps. Leaves spiral, narrow, 1-nerved, minutely emarginate, sessile. Flowers perfect, axillary, solitary or in clusters, the pedicels slender, bracteate. Sepals 3, equal. Petals 3, equal. Stamens 3, hypogynous, alternate with the petals; filaments free, somewhat dilated at the base; anthers basifixed, 4-celled, dehiscing by a single apical or subapical pore. Ovary superior, 1-celled; ovules several on 3 parietal placentae. Fruit a 3-gonal, septicidal capsule.

a. Stems usually tufted or matted; pedicels usually longer than the leaves; capsule subglobose or ovoid, nearly as broad as long ..... 1. M. AUBLETI
aa. Stems usually weak and elongate; pedicels usually shorter than the leaves; capsules oblong-ellipsoid, nearly twice as long as broad ..... 2. M. FLUVIATILIS

1. MAYACA AUBLETI Michx. Fl. Bor. Am. 1:26. 1803; A. C. Smith, N. Am. Fl. 19:2. 1937.

Syena Nuttalliana Schultes in R. & S. Syst. 1:343. 1822.
Mayaca Michauxii Schott & Endl. Melet. 24. 1832.

Syena Aubleti Michx. in Schott & Endl. loc. cit. 1832, in synon.
Mayaca longipes Gandoger, Bull. Soc. Bot. Fr. 66:293. 1920.

Stems usually tufted or matted, 2–20 cm. long. Leaves densely crowded, narrowly lanceolate to linear-lanceolate, 3–5 mm. long. Flowers violet to pink or white; pedicels 4–25 mm. long; sepals ovate-lanceolate, 3–4 mm. long; petals ovate, 3–4 mm. long, rounded at the tip. Capsules broadly ovoid, 2.5–4.5 mm. long.

Southern Virginia to Florida and Texas; Cuba, eastern Mexico to Panama.

PANAMÁ: Nuevo San Francisco, *Standley 30773;* Las Sabanas, *Standley 40772;* Chepo, *Pittier 4678.*

Fig. 93. *Mayaca fluviatilis*

2. MAYACA FLUVIATILIS Aubl. Hist. Pl. Guian. Fr. 1:42. 1775; A. C. Smith, N. Am. Fl. 19:1. 1937.

Syena Mayaca J. F. Gmel. Syst. Nat. 2:121. 1791.
Syena fluviatilis (Aubl.) Willd. Sp. Pl. 1:254. 1797.
Mayaca Wrightii Griseb. Cat. Pl. Cub. 224. 1866.
Mayaca caroliniana Gandoger, Bull. Soc. Bot. Fr. 66:293. 1920.

Stems elongate and trailing, often submerged. Leaves very numerous, linear-lanceolate or filiform, 4–20 mm. long, 0.3–0.6 mm. broad. Flowers violet to pink or white; pedicels 1–5 mm. long; sepals ovate-lanceolate, 3–4 mm. long; petals ovate, 3–4 mm. long. Capsules oblong-ellipsoid, 3.5–5.0 mm. long, 1.5–3.0 mm. broad.

North Carolina to Florida and Mississippi; Cuba, Jamaica, Hispaniola, Panama and northern South America, Trinidad. In swamps and temporary pools in savannas.

PANAMÁ: road to Chepo, *Hunter & Steyermark s. n.*

It is rather questionable whether these species represent distinct biological entities.

XYRIDACEAE

1. XYRIS L.

XYRIS L. Sp. Pl. 42. 1753; Malme, N. Am. Fl. 19:3. 1937.
Kotsjiletti Adans. Fam. Pl. 2:60, 544. 1763.

Perennial, occasionally annual, tufted herbs of damp or wet situations. Leaves mostly basal, linear, terete, or lanceolate, sheathing at the base. Flowering scapes erect, simple, terminated by a solitary dense spike or head, and usually bearing 1 to several bladeless sheaths at the base. Flowering spikes or heads globose to elongate; bracts glumaceous, rather rigid or thin and papery, spirally imbricated, the lower usually sterile, the upper subtending the rather inconspicuous flowers. Flowers perfect, solitary and sessile in the axils of the bracts, yellow or blue, rarely white. Sepals 2–3, unequal. Petals 3, usually equal, obovate-spatulate, the basal claws free or united. Stamens 3, opposite the petals and adnate to claws; filaments usually short and flattened; anthers basifixed, 2-celled, dehiscent longitudinally. Staminodes (when present) 3, alternating with the petals, usually bifid at the tip, the branches usually tipped with brush-like tufts of moniliform hairs. Ovary 1-celled or imperfectly 3-celled; ovules numerous; style filiform, usually 3-cleft at the tip. Capsule loculicidal.

1. XYRIS JUPICAI L. C. Rich. Act. Soc. Hist. Nat. Paris 1:106. 1792; Malme, N. Am. Fl. 19:11. 1937.

Fig. 94. *Xyris Jupicai*

Xyris communis Kunth, Enum. 4:12. 1843.
Xyris surinamensis Miq. Linnaea 17:58. 1843.
Xyris arenicola Miq. ibid. 18:75. 1844.
Xyris acuminata Miq. ex Steud. Syn. Cyp. 284 1855.
Xyris gymnoptera Griseb. Cat. Pl. Cub. 223. 1866.

Somewhat tufted or annual. Leaves linear, 12–30 (–40) cm. long, acute, smooth or rarely minutely tuberculate beneath; sheath ⅓–½ the length of the blade. Flowering scapes slender, 1- to 2-costate, 3–6 dm. tall; spikes many-flowered, ovoid or ellipsoid, 8–13 mm. long, 5–8 mm. thick, the flowering bracts obovate, 5–7 mm. long, 3.5–4.5 mm. broad, entire, tawny or rusty, somewhat shining, bearing on the outer face a greenish ovate area about 2 mm. long. Sepals 2, included within the bracts, the keel entire below, lacerate-dentate from above the middle. Petals yellow, 5 mm. long.

Maryland to Florida and Texas, Mexico south to Uruguay; Greater Antilles. In wet savannas and marshes.

COCLÉ: Aguadulce, *Pittier 4836*.

ERIOCAULACEAE

By Harold N. Moldenke

Perennial or rarely annual aquatic or marsh herbs, mostly short-stemmed, usually monoecious, rarely dioecious; roots tufted, fibrous, knotty or spongy, often septate; leaves mostly basal and tufted, grass-like, usually crowded, often pellucid and loosely cellular, sometimes membranous; inflorescence capitate, in terminal solitary or umbellately aggregate involucrate heads, borne on long slender often scapose peduncles, which are sheathed at base; florets mostly actinomorphic, numerous, small, sessile or short-pedicellate on a variously shaped receptacle, usually each borne in the axil of a scarious scale-like colored or colorless receptacular bractlet, unisexual, mostly androgynous, the staminate and pistillate mixed together or the staminate in the center and the pistillate on the periphery, the sexes very rarely in separate heads; perianth (perigonium) scarious (chaffy) or membranous, rarely hyaline, its segments 2- or 3-merous, usually in 2 distinct series, the outer (calyx) free or rarely partially connate, the inner (corolla) often united in an infundibular fashion, rarely absent; stamens as many as the outer perianth-segments and alternate with them, or twice as many, inserted on the corolla (when present); filaments distinct; anthers small, 2- or 4-celled, composed of 1 or 2 thecae, opening by longitudinal slits, introrse; staminodes rarely present in pistillate florets; ovary superior, 2- or 3-locular; style terminal, often appendaged; stigmas 2 or 3, simple or lobed; ovules solitary and pendulous in each locule, orthotropous; fruit a 2- or 3-celled, 2- or 3-seeded, membranous capsule, loculicidally dehiscent; seeds solitary, pendulous, with a small embryo borne at the apex of a copious mealy endosperm; cotyledon one.

a. Stamens 4 or 6, twice as many as the outer perianth segments (rarely 3) ..... 1. Eriocaulon
aa. Stamens 2 or 3, as many as the outer perianth segments.
  b. Anthers 4-celled, composed of 2 thecae; stems not floating.
    c. Inner perianth segments of pistillate florets free ..... 2. Paepalanthus
    cc. Inner perianth segments of pistillate florets connate at the middle ..... 3. Syngonanthus
  bb. Anthers 2-celled, composed of 1 theca; stems usually floating ..... 4. Tonina

1. ERIOCAULON L.

Eriocaulon L. Sp. Pl., ed. 1, 87. 1753; Gen. Pl., ed. 5, 38. 1754.
Cespa Hill, Herb. Brit. 1: *pl. 66* (some copies). 1769.
Nasmythia Huds. Fl. Ang., ed. 2, 414. 1778.
Randalia Petiv. ex Desv., Ann. Sci. Nat. Paris I, 13:47, *pl. 5, fig. 2*. 1828.
Symphachne P. Beauv. ex Desv. op. cit. 47, *pl. 5, fig. 3*. 1828.
Sphaerochloa P. Beauv. ex Desv. op. cit. 47. 1828.
Sphoerochloa P. Beauv. op. cit. *pl. 5, fig. 1*. 1828.
Leucocephala Roxb. Fl. Ind. 3:612. 1832.
Electrosperma F. Muell. Trans. Phil. Soc. Victoria 1:23. 1855.
Dichrolepis Welw. Apont. Phyt.-geogr. 542. 1859.
Lasiolepis Böck. Flora 56:90. 1873.

Stems mostly very short, rarely elongate and equally covered with leaves throughout; leaves mostly tufted, membranous or very thin and pellucid, more or

less linear or linear-lanceolate and grass-like, sessile and clasping at the base, very often fenestrate; florets dimerous or trimerous, the staminate mixed with the pistillate or segregated on separate heads or (rarely) on separate plants; perigonium almost always double; staminate florets with the sepals free at the base or often more or less connate into a split spathe, the 2 or 3 petals united below into a tube, free at the apex, the lobes usually bearing a small black gland on the inner surface near the apex; stamens twice as many as the sepals (or rarely 3) and exserted; anthers 4-celled, mostly black, composed of 2 thecae; pistillate florets with free or (rarely) spathaceous-connate sepals; petals free or rarely none, usually each bearing a small black gland slightly below the apex within; style-appendages none; stigmas 2 or 3, simple.

a. Both staminate and pistillate florets dimerous; stamens 4; stigmas 2; ovary 2-ovulate.
  b. Heads dark gray; peduncles to 9.5 cm. long; receptacular and involucral bractlets light brown, sharply acute or acuminate at the apex ..... 1. E. SEEMANNII
  bb. Heads lightly flavescent-stramineous; peduncles to 19.5 cm. long; receptacular and involucral bractlets hyaline or flavescent, broadly rounded at the apex ..... 2. E. WOODSONIANUM
aa. Both staminate and pistillate florets trimerous; stigmas 3; ovary 3-ovulate.
  b. Sepals of mature staminate florets not spathaceous; involucral bractlets fuscous-nigrescent, obovate or subrotund ..... 3. E. PANAMENSE
  bb. Sepals of mature staminate florets connate into a split spathe; involucral bractlets light-stramineous, ovate ..... 4. E. WILLIAMSII

Fig. 93. *Eriocaulon Seemannii*

1. ERIOCAULON SEEMANNII Moldenke, N. Am. Fl. 19:28. 1937.

Stems very short; leaves olivaceous, tufted, spreading or recurved, linear-lanceolate, 2.3–6 cm. long, 2.5–3 mm. wide at the middle, very thin-membranous or subpellucid, subulate-acute or acuminate at the apex (the tip itself bluntish), fenestrately 5- to 7-nerved (the fenestrations very conspicuous on both surfaces), glabrate; peduncles aggregate, very numerous, 19–40 per plant, slender, olivaceous, 4–9.5 cm. long, 3-costate, glabrous; sheaths loose, 1.5–4 cm. long, rather obscurely striate and fenestrate, bilobed at the apex, the blades short and sharply acute, scarious-margined; heads dark gray, hemispheric or globose, 2.5–4 mm. in diameter, slightly compressed in drying; involucral bractlets light brown, broad, elliptic, acute, glabrous; receptacle long-pilose; receptacular bractlets light brown (or hyaline at the base), spatulate, acute or acuminate, sparsely pubescent on the back; staminate florets: pedicellate; sepals 2, light brown toward

the apex, hyaline below, oblong or subobovate, concave, bluntish; petal-tube pale stramineous, its lobes very minute; anthers 4, black, roundish; pistillate florets: short-pedicellate; sepals 2, brown, spatulate, navicular, subacute, broadly winged-carinate at the middle, not crested, sparsely pilose at the apex; petals 2, pale stramineous, unequal, obovate, blunt, not notched, glabrous; ovary long-stalked, 2-ovulate; style shorter than the ovary; stigmas 2, longer than the ovary.

Wet meadows, Panama.

CANAL ZONE: meadows near Panamá City, *Seemann 295*. PANAMÁ: boggy grasslands and marginal thicks, between Pacora and Chepo, alt. about 25 m., *Woodson, Allen & Seibert 1650;* scarce in marsh, vicinity of Juan Franco race track, near Panamá, *Standley 27821*.

The Standley collection was originally distributed as *E. Schiedeanum* Körn., a trimerous Mexican species. *E. Seemannii* is thus far known only from Panama.

2. ERIOCAULON WOODSONIANUM Moldenke in Woodson & Schery, Ann. Missouri Bot. Gard. 27:268. 1940.

Dwarf plants; leaves tufted, erect or spreading, thin-membranous or pellucid, light green, linear, 4–7 cm. long, 1.5–3 mm. wide at the middle, subulate at the apex, not at all revolute along the margins, glabrous, fenestrately many-nerved (the fenestrations especially conspicuous beneath); peduncles 5–21 per plant, slender, 6.5–19.5 cm. long, 3-costate, slightly twisted, glabrous; sheaths loose, 3–5 cm. long, much shorter than the leaves, glabrous, not fenestrate, deeply lobed at the apex; heads hemispheric, lightly flavescent-stramineous, 3–4.5 mm. in diameter; involucral bractlets scarious, hyaline or stramineous, varying from ovate to elliptic or obovate, about 3 mm. long, 2–2.5 mm. wide, obtuse at the apex, usually not much narrowed at the base; receptacular bractlets broadly elliptic, scarious, somewhat flavescent along the midrib and at the apex, hyaline toward the margins, about 2.4 mm. long and wide, rounded at the apex, somewhat narrowed at the base, decidedly navicular and closely imbricate; staminate florets: pedicellate (pedicels about 0.5 mm. long); sepals 2, free to the base, obovate, about 1.5 mm. long and about equally wide at the apex, hyaline, transparent, conduplicate around the corolla-tube, carinate in a median line on the back, slightly emarginate at the apex, erect, glabrous throughout; corolla-lobes 2, minute, obtuse, non-glanduliferous; stamens 4; anthers brown; pistillate florets: pedicellate (pedicels about 0.5 mm. long); sepals 2, broadly obovate, hyaline, transparent, about 1.7 mm. long and equally wide at the apex, slightly emarginate, flat (not conduplicate), with a very broad wing or crest on the median keel on the back, glabrous; petals 2, free, hyaline, spatulate, transparent, about 1.9 mm. long, about 0.7 mm. wide at the apex; ovary 2-celled.

Known only from the type collection.

PANAMÁ: margin of pool in savanna along road between Panamá and Chepo, *Dodge, Hunter, Steyermark & Allen 16717*.

3. Eriocaulon panamense Moldenke, N. Am. Fl. 19:31. 1937.

Stems very short; leaves tufted, erect, olivaceous, brunneous in drying, broadly linear, 3.5–7.7 cm. long, about 3 mm. wide at the middle, very blunt, fenestrately many-nerved (the fenestrations plainly discernible, more conspicuous beneath and at the base), glabrate; peduncles aggregate, 3 or 4 per plant, slender, brunneous, about 5-costate, slightly or not at all twisted, glabrous; sheaths loose, 4.5–6 cm. long, very obscurely fenestrate and striate, not twisted, obliquely split at the apex, the blade short and blunt, scarious-margined; heads hemispheric, 4–7 mm. in diameter, compressed in drying; involucral bractlets fuscous-nigrescent, obovate (or the outermost subrotund), rounded at the apex, glabrous; receptacle glabrous; receptacular bractlets stramineous below, olivaceous-nigrescent toward the apex, obovate, acute, short-pilose toward the apex; staminate florets: sepals 3, connate at the very base only, nigrescent, plane or subnavicular, spatulate, obtuse, sparingly pilose on the back at the apex; petal-tube stramineous, its lobes 3, short, unequal, ciliate; stamens 6; anthers black, oblong; pistillate florets: sepals 3, nigrescent throughout, spatulate, navicular-concave, not alate, rounded to subacute at the apex, short-pilose on the back for the upper third and at the apex; petals 3, free, obovate, pale stramineous, black-glanduliferous at the apex, short-pilose within; style as long as the ovary; stigmas 3, twice as long as the style; ovary 3-celled.

Known only from the type locality.

chiriquí: wet meadows along Río Caldera, south of El Boquete, alt. 1250–1500 m., *Killip 3614*; swampy meadows, Finca Lérida to Boquete, alt. 1300–1700 m., *Woodson, Allen & Seibert 1130*.

4. Eriocaulon Williamsii Moldenke, N. Am. Fl. 19:36. 1937.

Dwarf plants; leaves tufted, erect or spreading, thin-membranous or pellucid, light green, linear, 1–4.5 cm. long, 1–2 mm. wide at the middle, subulate at the apex, often slightly revolute on old leaves, fenestrately many-nerved (the fenestrations especially conspicuous beneath), glabrous; peduncles 3 or 4 per plant, slender, 1.2–6.5 (–10) cm. long, usually rather obscurely 3-costate or striate, subglabrate; heads hemispheric or ovate-conic, dark gray, 2.5–4 mm. in diameter, compressed in drying; involucral bractlets rather few, light stramineous, ovate, blunt, glabrous; receptacle glabrous; receptacular bractlets hyaline, with a grayish median line at the middle on the back, obovate, acute, glabrous; staminate florets: long-pedicellate; sepals 3, nigrescent, spathaceous, the lobes short, often incurved and acute, glabrous; petal-tube pale stramineous, its lobes very minute, glabrous; anthers 6, white, rotund; pistillate florets: pedicellate; sepals 3, hyaline (or grayish toward the apex), narrowly linear, glabrous; petals hyaline, narrowly linear, glabrous; style elongate, longer than the long-stalked ovary; stigmas 3, longer than the ovary.

British Honduras and Panama.

coclé: on clay of dried-up pond at Penonomé and vicinity, alt. 15–300 m., *Williams 299*.

2. PAEPALANTHUS Mart.

PAEPALANTHUS Mart. Nov. Act. Phys.-med. Acad. Caes. Leopold.-Carol. Nat. Cur. 17[1]:13. 1835. *Nomen conservandum.*

Dupatya Vell. Fl. Flum. 35. 1825. *Nomen rejiciendum.*
Stephanophyllum Guill. in Deless. Icon. Sel. 3:61, *pl. 98.* 1837, in obs.
Cladocaulon G. Gardn. in Hook. Icon. Pl. *pl. 528.* 1843.
Limnoxeranthemum Salzm. ex Steud. Syn. Pl. Cyp. 2:281. 1855, in syn.

Stems and branches very variable; leaves thin-membranous to thick-coriaceous, usually not fenestrate; heads villous; receptacular bractlets present; florets mostly polygamous, 2- or 3-merous; perianth (perigonium) double and involute; staminate florets with the sepals more or less connate toward the base, the petals connate into a membranous, hollow, glabrous (or rarely pilose within), slightly 2- or 3-lobed, eglandular, infundibular tube, which is finally almost always involute; stamens of the same number as the petals (2 or 3) and opposite them, exserted; anthers 4-celled (composed of 2 thecae); and in the center a double or triple papillose rudimentary pistil; pistillate florets with the sepals usually connate at the very base and becoming rigid in age; petals free and eglandular; ovary 2- or 3-celled, the style-appendages mostly 2 or 3, papillose at the apex, inserted at about the same height as the stigmas and placed between them; the stigma simple or more often bifid; hairs of the receptacular bractlets and perigonium granulose within, almost always clavate-obtuse, often tuberculate.

1. PAEPALANTHUS LAMARCKII Kunth, Enum. Pl. 3:506. 1841.

Eriocaulon fasciculatum Lam. Encycl. Méth. 3:276. 1789 (not *E. fasciculatum* Rottb., 1778).
Paepalanthus Ottonis Klotzsch in Schomb. Reise in Br. Guian. 3:1115. 1848.
Eriocaulon Lamarckii (Kunth) Steud. Syn. Pl. Cyp. 276. 1855.
Lasiolepis pilosa Böck. Flora 56:90. 1873.
Dupatya Lamarckii (Kunth) Kuntze, Rev. Gen. Pl. 2:746. 1891.

Stems simple, 2–8 cm. long; leaves dull- or grayish-green, the older ones olivaceous, plane, linear-lanceolate or broadly linear, 1.3–3 cm. long, 0.5–2.3 mm. wide at the middle, ampliate-clasping at the base, narrowed to a rather acute or obtuse apex, many-striate, sparsely puberulent or pilose, soon glabrescent; peduncles fasciculate at the apex of the stem, 2–20 per plant, usually numerous, 1.5–7 cm. long, irregularly and more or less densely spreading-pilose; sheaths rather loose, 9–13 mm. long, long-pilose, the blade rather rigid, often lobed or bifid, attenuate and sharply acute at the apex, often somewhat spreading, long-ciliate, at first puberulent, eventually calvescent; heads dark brown, globose, 2–3 mm. in diameter, villous; involucral bractlets gray-brown, with a lighter midrib, obovate, subacute and densely pilose at the apex; receptacle pilose; receptacular bractlets brown, with a white midrib, spatulate, acute at the apex, densely long-pilose above the middle on the back; staminate florets: sepals 3, stramineous at the base, dark brown at the apex (except for a broad white central band), spatulate, obtuse and

ciliate at the apex; petal-tube stramineous; stamens 3; pistillate florets: sepals similar in color and texture to those of the staminate florets, obovate, pilose along the margins and at the apex, spreading; petals 3, tiny, white or hyaline, linear, blunt and sparsely ciliate at the apex; ovary 3-celled; style-appendages long and hyaline; stigmas 3, brown, shorter than the style-appendages; seeds slightly curved, cancellate.

Hispaniola, Cuba, and British Honduras to Panama, Trinidad, and Brazil.

COCLÉ: in savannas near sea-level, Aguadulce, *Pittier 4932;* marshy places, lower portion of valley and marshes along Río Antón, El Valle de Antón, alt. about 500 m., *Hunter & Allen 365.*

3. SYNGONANTHUS Ruhl.

SYNGONANTHUS Ruhl. in Urb. Symb. Ant. 1:487. 1900.

Stems very short or elongate, sterile or fertile, simple or branched; roots rather thick or incrassate, porous, whitish; heads pilose or subglabrate, the hairs always acute and smooth; receptacular bractlets almost always none; florets trimerous; sepals mostly free or almost so; staminate florets with the petals connate into an infundibular, 3-lobed, glabrous, finally almost always involute (rarely 3-parted) tube and the anthers 4-celled, composed of 2 thecae; pistillate florets with the petals connate by their margins at or above the middle, the base and apex free, the apex finally mostly involute; style terete, its appendages non-papillose, sometimes obsolete; stigmas simple, inserted at the same height on the style as its appendages.

1. SYNGONANTHUS PITTIERI Moldenke in Woodson & Schery, Ann. Missouri Bot. Gard. 27:269. 1940.

Dwarf plants; leaves few, tufted, recurved and usually closely appressed to the ground, membranous, olivaceous, linear, 1–1.5 cm. long, to 1 mm. wide at the middle, attenuate and subulate at the apex, densely strigose with whitish appressed antrorse hairs on both surfaces, not fenestrate; sheaths tightly appressed, 2–2.5 cm. long, greatly surpassing the leaves, densely pilose with irregular whitish hairs, deeply lobed at the apex; peduncles several per plant, stramineous, slender, rather obscurely costate, slightly twisted, glabrous; heads hemispheric, light gray or ashy, 3.5–4.5 mm. wide; involucral bractlets membranous, narrowly obovate or oblanceolate, about 2 mm. long and 1 mm. wide, brunnescent toward the middle, hyaline at the margins; receptacular bractlets none; staminate florets: pedicellate; pedicels about 0.5 mm. long, villous; sepals hyaline, transparent, narrow-elliptic, about 1.2 mm. long, about 0.5 mm. wide, glabrous; petal-tube hyaline, translucent, about 1.5 mm. long, 3-lobed at the apex; anthers 3, white; pistillate florets: pedicellate (pedicels about 0.7 mm. long, villous); sepals 3, free, hyaline, transparent, narrowly lanceolate, about 1.7 mm. long, about 0.5 mm. wide at the base, sharply acute or acuminate at the apex, glabrous throughout; petals narrowly oblong, hyaline and transparent, about 1 mm. long and 0.3 mm. wide, glabrous, connate by their margins above, free at the base.

Known only from the type collection.

CHIRIQUÍ: Sabana de El Boquete, alt. 700–1100 m., *Pittier 3316*.

4. TONINA Aubl.

TONINA Aubl. Hist. Pl. Guian. Fr. 2:856. 1775.
Hyphydra Schreb. Gen. 666. 1791.

Stems elongate, slender, usually floating, equally foliose throughout; peduncles apparently supra-axillary; florets trimerous, pedicellate; receptacle pilose; staminate florets with the sepals connate to the middle, the 3 petals connate into a short membranous shortly 3-lobed tube, which is concave above, 3 stamens, and 2-celled anthers (composed of 1 theca); pistillate florets with 3 rather thick and somewhat porous sepals, which are connate at the base, very small free long-pilose petals, 3 non-papillose style-appendages, and 3 bifid stigmas which are shorter than the style-appendages.

1. TONINA FLUVIATILIS Aubl. Hist. Pl. Guian. Fr. 2:857, *pl. 330*. 1775.
Hyphydra amplexicaulis Vahl, Symb. Bot. 3:99. 1794; Schreb. apud Ruhl. in Engl. Pflanzenreich 4^{30}:240. 1903, in syn.
Eriocaulon amplexicaule (Vahl) Rottb. Descr. Pl. Surinam. 7, *pl. 1, fig. 1*. 1798.

Stems greatly elongate, slender, lax, 20–80 or more cm. long, often branched, about 1 mm. in diameter, equally and persistently foliose; leaves rather dense, spreading, lanceolate or oblong, 0.8–1.5 cm. long, 1–2.5 mm. wide at the middle, sessile and more or less clasping at base, acute and often recurved at apex, long-ciliate along the margins throughout or sparsely ciliate at base only and otherwise glabrous on both surfaces; peduncles dispersed over the stem and branches, 2–13 mm. long (mostly about 1 cm. long when mature), glabrous; heads echinulate-globose, 4–8 mm. in diameter, subglabrate; involucral bractlets ovate or obovate, long-cuspidate, glabrous except for the pilose-ciliate base and apex, the outer ones broader; receptacular bractlets narrowly oblong-obovate, cuspidate-acuminate, ciliate below the apex; staminate florets: sepals 3, fuscous, broadly obovate, connate to the middle, involute above, abruptly acute at apex, very concave ventrally; pistillate florets: sepals ovate, concave ventrally, long-cuspidate, ciliate; petals linear.

Quiet water of marshes, swamps, ponds, and streams from Cuba and British Honduras to Colombia, Trinidad, and Brazil.

CHIRIQUÍ: Río Caldera, Boquete, *Woodson & Schery 752*.

RAPATEACEAE

1. STEGOLEPIS

STEGOLEPIS Klotzsch ex Koernicke, Linnaea 37:480, *pl. 1, fig. 22-25*. 1872; Pilger in Engl. & Prantl, Nat. Pflanzenfam. 15a:63. 1930.

Rather massive epiphytic or marsh herbs somewhat resembling large sedges.

Stem a fleshy naked rhizome. Leaves equitant, relatively large, broadly sheathing at the base, the elongate blade orientated at approximately 180° to the sheath. Flowering scapes axillary, elongate, very slender, naked, bearing 1 to few sessile 1-flowered heads at the tip. Flower heads sheathed at the base by several pairs of small subscarious bracts. Sepals 3, equal, coherent at the base. Petals 3, equal, coherent at the base into a tube. Stamens 6, epipetalous, equal; filaments rather short; anthers basifixed, dehiscent by an apical pore. Pistil 3-celled, multi-ovulate. Fruit a loculicidal capsule.

Fig. 96. *Stegolepis Allenii*

1. STEGOLEPIS ALLENII Steyermark in Standl. & Steyerm. Field Mus. Bot. Ser. 22:325. 1940.

Epiphytic acaulescent herbs from a thick elongate rhizome about 10 cm. long and 1.5 cm. thick. Leaves distichous, ensiform, 30–40 cm. long, 1.5–2.8 cm. broad, acute, narrowed toward the basal sheath; sheath triangular-ovate, 10–15 cm. long, 2.5–3.5 cm. broad. Flowering scapes very slender, 30–50 cm. long, gradually dilating to the 1–2 sessile flowering heads. Flowering heads narrowly elliptic, about 1 cm. long, sheathed at the base by several pairs of closely imbricated ovate to ovate-lanceolate bracts 1–7 mm. long, glabrous.

Panama, epiphytic in highland forest.

COCLÉ: El Valle de Antón, *Allen 2153*.

BROMELIACEAE

By LYMAN B. SMITH

Herbs in all the Panamanian species, mostly epiphytic or saxicolous. Leaves spirally arranged, usually basal, simple, entire or spinose-serrate, at least in youth bearing peltate scales serving to collect and hold moisture. Inflorescence simple or compound, usually bearing brightly colored bracts. Flowers perfect or functionally dioecious. Perianth heterochlamydeous with 3 sepals and 3 petals, the segments of each series free or variously joined. Stamens 6, the filaments free or joined to the petals or to each other. Ovary superior to inferior, 3-celled. Fruit capsular or baccate. Seeds naked, winged or plumose. Embryo small, at the base of the mealy endosperm. About 50 genera and 1,500 species, indigenous to tropical and subtropical America except for a single African species.

a. Ovary wholly or partly superior; fruit capsular; seeds appendaged.
  b. Seeds with entire appendages; leaves of the Panamanian species spinose-serrate; ovary only in part superior; plants usually terrestrial ..... 1. PITCAIRNIA
  bb. Seeds plumose; leaves always entire; ovary nearly or quite superior; plants chiefly epiphytic.
    c. Appendage of the seed basal, straight at maturity (for key to fruiting specimens of genera 2–5 see p. 79).
      d. Petals nearly or quite free.
        e. Petals naked; inflorescence of one or more distichous-flowered spikes or rarely simple and polystichous ..... 2. TILLANDSIA
        ee. Petals each bearing 2 scales on the inner surface.
          f. Inflorescence of one or more distichous-flowered spikes; floral bracts usually forming the conspicuous element of the inflorescence; branches usually elongate when present ..... 3. VRIESIA
          ff. Inflorescence of several polystichous-flowered spikes, though the flowers sometimes turning secund or the spikes reduced to single flowers (but the two series of bracts indicating a compound inflorescence); primary bracts the conspicuous element of the inflorescence; branches usually short ..... 4. THECOPHYLLUM
      dd. Petals joined or closely agglutinated for most of their length; inflorescence always of polystichous-flowered spikes ..... 5. GUZMANIA
    cc. Appendage of the seed apical, folded over at maturity; sepals distinctly asymmetric in all Panamanian species; flowers polystichous ..... 6. CATOPSIS
aa. Ovary inferior; fruit baccate; seeds naked; leaves mostly serrate.
  b. Ovaries remaining distinct; inflorescence without a large foliaceous coma.
    c. Petals joined to the filament-tube but with free margins, fleshy, 3–4 cm. long; sepals with soft points; flowers pedicellate; inflorescence compound ..... 7. BROMELIA
    cc. Petals free, not fleshy; filaments not forming a tube.
      d. Petals up to 43 mm. long, spirally recurved at anthesis, linear; sepals unarmed, symmetric; inflorescence simple, pendulous ..... 8. BILLBERGIA
      dd. Petals erect or divergent at anthesis; sepals mostly pungent or mucronate, usually asymmetric; petals usually small ..... 9. AECHMEA
  bb. Ovaries fusing into a syncarp; inflorescence bearing a large foliaceous coma ..... 10. ANANAS

1. PITCAIRNIA L'Hérit.

Pitcairnia L'Hérit. Sert. Angl. 7. 1788. *Nomen conservandum.*

Hepetis Sw. Prodr. 4, 56. 1788.
Conanthes Raf. Fl. Tell. 4:24. 1838.
Neumannia Brongn. Ann. Sci. Nat. II. 15:369. 1841.
Lamproconus Lemaire, Jard. Fleur. 2:*pl. 127*. 1852.
Cochliopetalum Beer in Flora 37:347. 1854.
Phlomostachys Beer, Bromel. 16, 45. 1857.
Orthopetalum Beer, Bromel. 17, 70. 1857.
Pepinia Brongn. ex André, Ill. Hortic. 17:32. 1870.
Melinonia Brongn. ex E. Morr. Cat. Bromél. Liége, 10. 1873.

Plants mostly terrestrial, rarely epiphytic, usually stemless. Leaves fasciculate or imbricate along a stem, entire or spinose-serrate, the sheath small, often bulbous-thickened, the blades linear to lanceolate with a definite petiole or narrowly triangular, sometimes dimorphic with some blades reduced to horny spinose-serrate spines, the larger blades sometimes deciduous. Inflorescence simple or compound. Flowers perfect, pedicellate to subsessile. Sepals free, acute or obtuse. Petals free, slightly zygomorphic in most species, naked or appendaged on the inside near base. Stamens from shorter to longer than the petals, the anthers linear. Ovary usually superior for most of its length. Style filiform. Ovules many, usually caudate. Capsule usually septicidal. Seeds caudate at both ends or rarely with an annular wing.

a. Floral bracts exceeding the sepals, broad.
  b. Leaf-blades petiolate, 55–125 mm. wide; inflorescence cylindric, elongate.
    c. Sepals oblong, 25 mm. long; flowers remaining erect; leaves 55–60 mm. wide ..... 1. P. atrorubens
    cc. Sepals oblanceolate, 45 mm. long; flowers often spreading at anthesis; leaves 105–125 mm. wide ..... 2. P. oblanceolata
  bb. Leaf blades sessile, linear, 5–7 mm. wide ..... 3. P. aphelandraeflora
aa. Floral bracts shorter than the sepals.
  b. Plant not over 2 dm. high; scape short or none; leaf-blades dimorphic with the green ones deciduous ..... 4. P. heterophylla
  bb. Plant 6–20 dm. high or more; scape elongate.
    c. Inflorescence simple; leaf-blades flat.
      d. Leaves all alike, the blades linear, 13 mm. wide; sepals 34 mm. long ..... 5. P. carnea
      dd. Leaves dimorphic, the larger with blades up to 7 cm. wide; sepals 20 mm. long ..... 6. P. Kalbreyeri
    cc. Inflorescence laxly tripinnate; leaf-blades plicate ..... 7. P. Valerii

1. Pitcairnia atrorubens (Beer) Baker in Jour. Bot. 19:307. 1881.

Phlomostachys atrorubens Beer, Bromel. 48. 1857.
Puya Warszewiczii H. Wendl. ex Hook. in Bot. Mag. *pl. 5225*. 1861.
Pitcairnia Lamarcheana E. Morr. ex Baker, Handb. Bromel. 111. 1889.
Pitcairnia Lindenii Baker, Handb. Bromel. 112. 1889.
Pitcairnia atrorubens var. *Lamarcheana* (E. Morr. ex Baker) Mez in DC. Monogr. Phan. 9:457. 1896.
Hepetis atrorubens (Beer) Mez in DC. Monogr. Phan. 9:973. 1896.
Hepetis Lindeni (Baker) Mez in DC. Monogr. Phan. 9:974. 1896.

Plant 6–9 dm. high. Leaves about 6, some much reduced, ovate, abruptly acute, brown, other leaves 6–9 dm. long, petiolate; sheaths triangular-ovate,

brown-lepidote; petioles 2 dm. long, channeled, armed with small dark recurved spines, tomentose-lepidote beneath; blades lanceolate, acuminate, 5 dm. long, 55–60 mm. wide, entire, glabrous. Scape erect, stout, elongate. Scape-bracts with a large ovate base and long acuminate blade, subglabrous, especially the upper ones brownish purple. Inflorescence simple, subspicate, obtuse, densely many-flowered, 2–3 dm. long, 3–5 cm. thick. Rhachis finely tomentose-lepidote, wholly concealed. Floral bracts broadly ovate with a narrowly triangular divergent blade, 5–7 cm. long, much exceeding the sepals, glabrous, deep reddish purple to bright red or rarely yellowish. Flowers subsessile. Sepals oblong, abruptly acute, short-mucronate, 25 mm. long, narrowly winged near apex, minutely lanate. Petals linear, broadly acute, exceeding the stamens, unequal, to 77 mm. long, pale yellow, bearing a large bidentate scale at base. Ovary ¾ superior. Ovules long-caudate. Capsule broadly ovoid, 13–20 mm. long.

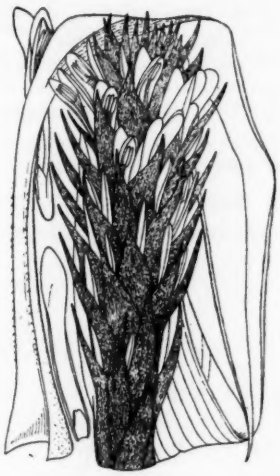

Fig. 97
Pitcairnia atrorubens

Costa Rica, Panama, Mexico (?).

CHIRIQUÍ: mountains of Chiriquí, *Warszewicz;* Boquete, Boquete District, alt. 1200 m., *Davidson 764.* COCLÉ: trail to Las Minas, north of El Valle de Antón, alt. 1000 m., *Allen 2466.*

Pitcairnia Lamarcheana has been separated as a species and then as a variety on its pale yellowish floral bracts, but it is known only from cultivation and it is not possible to say whether this difference is really significant.

2. PITCAIRNIA OBLANCEOLATA L. B. Smith in Contrib. Gray Herb. 117:26, *pl. 2, fig. 18.* 1937.

Climbing woody stem averaging over 1 m. long. Leaves few, erect; sheaths broadly ovate, 3–4 cm. long, dark castaneous, covered with a buff membrane of coalesced scales; petiole distinct, stout, channeled, densely serrate with dark spines to 3 mm. long; blades oblanceolate, acute, 85–95 cm. long, 105–125 mm. wide, entire, flat, glabrous or slightly flocculose beneath. Scape erect, stout, 3–4 dm. long. Scape-bracts very densely imbricate, some subfoliaceous, others vaginiform, elliptic, caudate. Inflorescence simple, densely cylindric, 3–8 dm. long, 3–4 cm. thick before anthesis. Floral bracts broadly elliptic, acute or acuminate, 7–8 cm. long, much exceeding the sepals, chartaceous, pink drying to castaneous. Flowers erect or spreading at anthesis. Pedicels stout, to 1 cm. long. Sepals oblanceolate, broadly acute and apiculate, 45 mm. long, 10 mm. wide, thin. Petals

Fig. 98
Pitcairnia oblanceolata

8 cm. long, exceeding the stamens, yellow, bearing a large truncate scale at base. Costa Rica, Panama.

PANAMÁ: epiphytic, summit of Cerro Campana, alt. 800–1000 m., *Allen 2214.*

3. PITCAIRNIA APHELANDRAEFLORA Lem. in Ill. Hortic. 16: Misc. 90. 1869.

Pepinia aphelandraeflora (Lem.) André in Ill. Hortic. 17:32, *pl. 5.* 1870.
Hepetis aphelandriflora (Lem.) Mez in DC. Monogr. Phan. 9:973. 1896.

Stem erect, 3 dm. high, 3–5 mm. thick, becoming naked below as the leaves disintegrate. Leaves all alike, densely imbricate, spreading, 2 dm. long, disintegrating with age but not regularly deciduous; sheaths elliptic, about 2 cm. long, sparsely and obscurely lepidote, their margins brown and membranaceous; blades linear, caudate-acuminate, 5–7 mm. wide, narrowly channelled, glabrous, very

Fig. 99. *Pitcairnia aphelandraeflora*

laxly and minutely serrulate toward apex. Scape very short. Scape-bracts imbricate, resembling the leaf-sheaths, thin. Inflorescence simple, densely spicate, few-flowered, glabrous. Floral bracts broadly ovate, thin, nerved, exceeding the sepals. Flowers erect. Pedicels very short. Sepals asymmetric, lanceolate or narrowly elliptic, 18 mm. long, ecarinate. Petals 5 cm. long, obtuse, bright red, naked or with 2 vertical folds near base. Stamens exserted. Ovary over ½ superior. Ovules obtuse.

Amazonian Brazil, Peru, Panama.

BOCAS DEL TORO: on rock, hills behind Fish Creek, *von Wedel 2282*.

4. PITCAIRNIA HETEROPHYLLA (Lindl.) Beer, Bromel. 68. 1857.

Puya heterophylla Lindl. in Bot. Reg. 26: *pl. 71*. 1840.
Puya longifolia C. Morren in Ann. Soc. Agr. Bot. Gand 2:483. 1846.
Hepetis heterophylla (Lindl.) Mez in DC. Monogr. Phan. 9:973. 1896.

Flowering plant 1 dm. high or rarely to 2 dm. Leaves very numerous in a large bulb; sheaths suborbicular to ovate, deep castaneous; blades dimorphic, the outer reduced to spinose-serrate castaneous spines, the inner green, linear, filiform-acuminate, to 7 dm. long and 13 mm. wide, pale-flocculose beneath, soon glabrous, deciduous before anthesis along a straight transverse line slightly above the base, entire above that line, spinulose-serrate below it. Scape usually very short and concealed by the leaves. Scape-bracts ovate, acuminate or the lower with a dark slenderly spinose apex, thin, white-flocculose. Inflorescence simple, capitate or subspicate, 3- to 12-flowered. Floral bracts like the upper scape-bracts, entire, shorter than the sepals. Flowers erect. Pedicels 3 mm. long, obconic. Sepals narrowly subtriangular, acuminate, 3 cm. long, subalate-carinate, thin, flocculose. Petals linear, to 55 mm. long, red or sometimes white, bearing a sacciform retuse scale well above base. Ovary about half superior. Ovules long-caudate. Capsule slenderly ovoid, acute, shorter than the sepals.

Fig. 100
Pitcairnia heterophylla

Southern Mexico to Panama, Venezuela, Ecuador.

CHIRIQUÍ: forest of Cerro de Lino, above El Boquete, alt. 1300–1560 m., *Pittier 3033*; in savannas, Cerro Vaca, eastern Chiriquí, alt. 900–1136 m., *Pittier 5373*. COCLÉ: lower portion of valley and marshes along Río Antón, El Valle de Antón, alt. ca. 500 m., *Hunter & Allen 364*. CANAL ZONE: Barro Colorado Island, *Aviles 61*; forest along banks of Quebrada La Palma and Cañon of Río Chagres, alt. 70–80 m., *Dodge & Allen 17467*. INDEFINITE: *Seemann 1564*.

5. PITCAIRNIA CARNEA Beer in Oesterr. Bot. Zeitschr. 8:182. 1858.

Puya carnea Regel, Cat. Pl. Hort. Aksak. 117. 1860, *nomen*.
Hepetis carnea (Beer) Mez in DC. Monogr. Phan. 9:973. 1896.

Stemless, 6 dm. high. Leaves all alike, many, densely fasciculate, persistent, narrowed between sheath and blade but not actually petiolate; sheaths broadly triangular-ovate, entire, brown at base; blades linear, filiform-acuminate, 6 dm. long, 13 mm. wide, entire except for a few teeth at base, densely white-lepidote beneath, glabrous above at maturity. Scape evident, straight, soon glabrous. Scape-bracts strict, lance-triangular, acuminate, pungent, lepidote, becoming glabrous, the upper ones equaling or slightly shorter than the internodes. Inflorescence racemose, cylindric, 2 dm. long, white-floccose. Floral bracts lanceolate, acuminate, equaling or exceeding the pedicels, the lower ones 18 mm. long. Flowers erect, about 55 mm. long. Pedicels slender, erect, 10–15 mm. long. Sepals sublinear, filiform-acuminate, 34 mm. long, 4 mm. wide, often uncinate, ecarinate. Petals red, strongly recurved after anthesis, bearing a large coarsely dentate scale at base. Stamens barely exserted. Ovary ¾ superior. Ovules long-caudate.

Endemic.

Indefinite. "VERAGUAS": known only from cultivation.

6. PITCAIRNIA KALBREYERI Baker in Jour. Bot. 19:273. 1881.
Hepetis Kalbreyeri (Baker) Mez in DC. Monogr. Phan. 9:974. 1896.

Stemless, over 2 m. high. Leaves dimorphic, some much reduced with spiniform serrate blades, others elongate, their blades linear-lanceolate, acuminate, up to 7 cm. wide, entire, more or less furfuraceous beneath, narrowed at base into a distinct elongate serrate petiole. Scape erect, soon glabrous. Scape-bracts lanceolate, acuminate, spinose-serrate, shorter than the internodes. Inflorescence simple, elongate, laxly racemose, soon glabrous. Floral bracts narrowly triangular, about equaling the pedicels. Flowers spreading, slender. Pedicels slender, 15 mm. long. Sepals narrowly triangular, acuminate, 2 cm. long, ecarinate, striate. Petals linear, to 65 mm. long, red or pink, naked or with minute auricles near base. Ovary ¾ superior.

Fig. 101
Pitcairnia Kalbreyeri

Colombia, Panama.

CHIRIQUÍ: rain forest, Bajo Chorro, Boquete District, alt. 1800 m., *Davidson 300.*

7. PITCAIRNIA VALERII Standley in Jour. Wash. Acad. 17:246. 1927.

Fig. 102
Pitcairnia Valerii

Plant to 2 m. high. Stem 10–13 cm. long, covered by the densely imbricate leaf-bases. Leaves 10–15 dm. long, entire; sheaths triangular, 1 dm. long, densely and finely brown-appressed-lepidote; petioles 15–25 cm. long, 5 mm. wide; blades sublinear, acuminate, 30–35 mm. wide, bearing 5 or 6 narrow grooves, finely nerved, glabrous. Scape erect, short, slender, glabrous. The lower scape-bracts foliaceous, 5 dm. long, the upper 2 cm. long. Inflorescence paniculate, laxly tripinnate, 7–18 dm. long, glabrous. Pri-

mary bracts deciduous by anthesis. Axes terete, smooth, red. Branches to 33 cm. long. Racemes many-flowered. Internodes 4–10 mm. long. Floral bracts lanceolate, acuminate, shorter than the pedicels, greenish with a scarious margin. Flowers spreading or nutant. Pedicels slender, 5–7 mm. long. Sepals narrowly triangular, acuminate, 9–12 mm. long, ecarinate. Petals linear, acute, 2 cm. long, red, bearing a small suborbicular scale at base. Stamens shorter than the petals. Ovary ⅘ superior. Seeds long-caudate.

Costa Rica, Panama.

PANAMÁ: summit of Cerro Campana in deep shade, alt. 1000 m., *Allen 2414*.

PITCAIRNIA SAXICOLA L. B. Smith in Contrib. Gray Herb. 117:29. 1937.

Pitcairnia fulgens A. Dietr. in Allg. Gartenzeit. 19:137. 1851, non Dietr. 1837.

Pitcairnia splendens Warscz. ex A. Dietr. in Allg. Gartenzeit. 19:176. 1851, non Poit. 1836.

This species is distinguished by narrow deciduous leaf-blades, large imbricate floral bracts and long scape and inflorescence. The original description drawn from cultivated material gave Guatemala as its home without indicating any more definite locality. However, herbarium specimens are labelled as from Chiriquí in Panama. Warsczewicz, the collector, had been in both Guatemala and Panama by 1851, so it is not possible to eliminate Panama on the basis of the date. A second collection of the species from southern Mexico, however, makes Guatemala seem much more probable as the origin of the type.

ARTIFICIAL KEY TO THE PANAMANIAN SPECIES OF *TILLANDSIA, VRIESIA, THECOPHYLLUM* AND *GUZMANIA*

a. Spikes with flowers distichous or secund, or else the inflorescence reduced to a single flower.
  b. Sepals asymmetric, free, broadest at middle or near the apex, not over 10 mm. long ..... TILLANDSIA spp. 9–12
  bb. Sepals symmetric or, if slightly asymmetric, ovate or lanceolate and broadest near the base.
    c. Inflorescence simple and bearing but a single series of bracts, or reduced to a single flower, either terminal, axillary or pseudo-axillary.
      d. Plant long-caulescent, slender, leaves filiform ..... TILLANDSIA sp. 8
      dd. Plant stemless.
        e. Flowers secund ..... VRIESIA spp. 4–8
        ee. Flowers not secund.
          f. Floral bracts less than twice as long as the internodes, spreading ..... TILLANDSIA sp. 13
          ff. Floral bracts at least twice as long as the internodes.
            g. Leaf-blades ligulate.
              h. Floral bracts carinate toward apex.
                i. Scape-bracts distichous, carinate; floral bracts curved out at mid-keel ..... TILLANDSIA sp. 14
                ii. Scape-bracts polystichous, ecarinate; floral bracts curved in at mid-keel ..... VRIESIA sp. 2
              hh. Floral bracts broadly convex and ecarinate.
                i. Floral bracts appearing rugose, at least under a lens, thick ..... VRIESIA spp. 3–4
                ii. Floral bracts even or nerved but not rugose; inflorescences several and lateral in each rosette ..... TILLANDSIA sp. 5
            gg. Leaf-blades narrowly triangular or linear, acuminate.
              h. Leaf-sheaths inflated and forming a pseudobulb.

i. Floral bracts glabrous or obscurely lepidote, even or nearly so ..... TILLANDSIA sp. 18
ii. Floral bracts densely lepidote, nerved ..... TILLANDSIA spp. 22–24
hh. Leaf-sheaths nearly or quite flat, not forming a pseudobulb.
i. Floral bracts coriaceous or subcoriaceous, at least the larger and central part of each one.
j. Flowers spreading, separated ..... TILLANDSIA sp. 7
jj. Flowers erect or suberect, contiguous.
k. Leaf-sheaths red-striate; spike strongly complanate ..... TILLANDSIA sp. 6
kk. Leaf-sheaths not striate, dark castaneous at least toward base.
l. Spike terete ..... TILLANDSIA sp. 17
ll. Spike more or less complanate ..... TILLANDSIA spp. 19–21
ii. Floral bracts subchartaceous to membranaceous ..... TILLANDSIA spp. 25–27
cc. Inflorescence of 2 or more branches.
d. Flowers secund.
e. Pedicels slender, 1–2 cm. long; sepals 7–11 mm. long ..... THECOPHYLLUM sp. 5
ee. Pedicels stout; sepals 25–45 mm. long.
f. Floral bracts abruptly acute; rhachis even ..... VRIESIA sp. 6
ff. Floral bracts acuminate; rhachis verrucose just below the nodes ..... VRIESIA sp. 8
dd. Flowers not secund.
e. Floral bracts less than twice as long as the internodes, spreading ..... TILLANDSIA sp. 13
ee. Floral bracts at least twice as long as the internodes.
f. Leaf-sheaths inflated and forming a pseudobulb.
g. Floral bracts glabrous or obscurely lepidote, even or nearly so ..... TILLANDSIA sp. 18
gg. Floral bracts densely lepidote, nerved ..... TILLANDSIA spp. 23–24
ff. Leaf-sheaths nearly or quite flat, not forming a pseudobulb.
h. Leaf-blades linear-subulate to filiform; leaves closely fasciculate ..... TILLANDSIA spp. 15–16
hh. Leaf-blades definitely if narrowly triangular or ligulate.
i. Leaf-blades ligulate.
j. Sepals broadly elliptic, obtuse, 21 mm. wide ..... VRIESIA sp. 1
jj. Sepals much narrower ..... TILLANDSIA spp. 1–3
ii. Leaf-blades narrowly triangular.
j. Floral bracts coriaceous or subcoriaceous, at least the larger and central part of each one.
k. Spikes terete ..... TILLANDSIA sp. 17
kk. Spikes more or less complanate ..... TILLANDSIA spp. 19–21
jj. Floral bracts subchartaceous to membranaceous.
k. Leaf-sheaths castaneous, darker than the blades; floral bracts 25–35 mm. long ..... TILLANDSIA sp. 25
kk. Leaf-sheaths concolorous with the blades.
l. Spikes 1–2 cm. wide; plant 2–6 dm. high ..... TILLANDSIA sp. 26
ll. Spikes 12 mm. wide; plant 1 m. high ..... TILLANDSIA sp. 4
aa. Spikes with flowers polystichous.
b. Inflorescence simple and bearing but a single series of bracts.
c. Leaf-blades filiform-subulate; leaves closely fasciculate; floral bracts coriaceous ..... TILLANDSIA sp. 16
cc. Leaf-blades narrowly triangular to ligulate, definitely flattened ..... GUZMANIA spp. 1–7
bb. Inflorescence compound (when perfect flowers are single in the axil of each primary bract, the presence of floral bracts indicates a compound inflorescence).
c. Branches of the inflorescence nearly or quite aborted with the flowers fascicled or solitary in the axils of the primary bracts ..... THECOPHYLLUM spp. 1–4
cc. Branches of the inflorescence well developed.
d. Floral bracts equaling or exceeding the sepals ..... GUZMANIA spp. 8–9
dd. Floral bracts exceeded by the sepals.

e. Pedicels 1–2 cm. long, slender ..... THECOPHYLLUM sp. 5
ee. Pedicels short and stout or almost lacking.
f. Sepals nearly as broad as long, free ..... THECOPHYLLUM sp. 6
ff. Sepals at least twice as long as broad ..... GUZMANIA spp. 10–13

2. TILLANDSIA L.

TILLANDSIA L. Sp. Pl. 286. 1753.

Renealmia L. Sp. Pl. 286. 1753.
Bonapartea R. & P. Fl. Peruv. 3:38. 1802.
Acanthospora Spreng. Anl. ed. 2, 2:255. 1817.
Misandra Dietr. Lex. Nachtr. 5:102. 1819, non Commerson, 1789.
Dendropogon Raf. Neog. 3. 1825.
Buonapartea Sweet, Hort. Brit. ed. 3. 706. 1839.
Strepsia Nutt. ex Steud. Nomencl. Bot. ed. 2, 2:645. 1841.
Allardtia A. Dietr. in Allg. Gartenzeit. 20:241. 1852.
Anoplophytum Beer in Flora 37:346. 1854.
Diaphoranthema Beer in Flora 37:349. 1854.
Phytarrhiza de Vis. in Mem. Ist. Veneto 5:340. 1855.
Platystachys Beer, Bromel. 18, 80. 1857.
Pityrophyllum Beer, Bromel. 17, 79. 1857.
Wallisia E. Morr. in Belg. Hortic. 20:97. 1870.
Cipuropsis Ule in Verhandl. Bot. Ver. Brandenburg 48:148. 1907.

Caulescent or acaulescent herbs of very variable habit. Leaves rosulate or fasciculate or distributed along a stem, polystichous or distichous, entire, blades ligulate or subtriangular or filiform. Scape usually distinct. Inflorescence various, usually of distichous-flowered spikes or sometimes reduced to a single polystichous-flowered spike by the reduction of the spikes to single flowers or rarely the whole inflorescence reduced to a single flower. Flowers perfect. Sepals usually symmetric, free, or equally or posteriorly joined. Petals free, naked or rarely with vertical folds. Stamens of various lengths relative to the petals and pistil. Ovary superior, glabrous. Ovules usually many and caudate. Capsule septicidal. Seeds erect, narrowly cylindric or fusiform, the plumose appendage white, straight, basal.

a. Stamens equaling or shorter than the petals.
b. Sepals symmetric, or if slightly asymmetric, ovate or lanceolate, broadest near base.
c. Stamens exserted from the throat of the corolla; style slender, much longer than the ovary ..... Subgenus ALLARDTIA
d. Inflorescence compound, central.
e. Leaf-blades ligulate; spikes lanceolate or elliptic.
f. Spikes dense or subdense; floral bracts about equaling the sepals.
g. Sepals 25 mm. or longer; primary bracts all much shorter than the branches ..... 1. T. RUBRA
gg. Sepals 15–20 mm. long; lower primary bracts exceeding the branches ..... 2. T. EXCELSA
ff. Spikes lax; floral bracts much shorter than the sepals ..... 3. T. SINGULARIS
ee. Leaf-blades narrowly triangular; spikes linear, 15 cm. long, 12 mm. wide ..... 4. T. SUBIMBRICATA
dd. Inflorescences simple, numerous and axillary in each rosette ..... 5. T. COMPLANATA
cc. Stamens deeply included; style short and stout; inflorescence simple in the Panamanian species.
f. Petal-blades broad, ovate or elliptic, showy ..... Subgenus PHYTARRHIZA
g. Flowers and their bracts suberect, densely imbricate ..... 6. T. ANCEPS

gg. Flowers and their bracts spreading; inflorescence lax ..... 7. T. MONADELPHA
ff. Petal-blades narrow, elliptic, inconspicuous; plants moss-like ..... Subgenus DIAPHORANTHEMA
..... 8. T. USNEOIDES
bb. Sepals asymmetric, free, oblong or broadest near apex, not over 10 mm. long ..... Subgenus PSEUDO-CATOPSIS
c. Floral bracts suborbicular, much exceeding the sepals, membranaceous; inflorescence simple or few-branched ..... 9. T. CRISPA
cc. Floral bracts barely if at all exceeding the sepals, firmer; inflorescence amply compound.
d. Floral bracts equaling or exceeding the sepals, glabrous or subglabrous; leaf-blades ligulate ..... 10. T. SPICULOSA
dd. Floral bracts shorter than the sepals; leaf-blades narrowly triangular.
e. Primary bracts at least half as long as the axillary spikes; flowers spreading; floral bracts densely lepidote ..... 11. T. ADPRESSA
ee. Primary bracts much shorter than the axillary spikes; flowers nearly erect; floral bracts subglabrous ..... 12. T. GUANACASTENSIS
aa. Stamens longer than the petals ..... Subgenus PLATYSTACHYS
b. Floral bracts much less than twice as long as the internodes; flowers spreading ..... 13. T. FLEXUOSA
bb. Floral bracts at least twice as long as the internodes; spikes usually dense.
c. Leaf-blades ligulate; scapes several and axillary in each rosette ..... 14. T. MULTICAULIS
cc. Leaf-blades narrowly triangular or linear.
d. Floral bracts coriaceous or subcoriaceous.
e. Leaf-blades linear-subulate; leaves closely fasciculate; leaf-sheaths triangular with abruptly auricled bases.
f. Spikes arching-recurved, linear; floral bracts barely imbricate ..... 15. T. FESTUCOIDES
ff. Spikes erect (or inflorescence simple), elliptic or lanceolate, dense ..... 16. T. JUNCEA
ee. Leaf-blades definitely if narrowly triangular; leaf-sheaths usually ovate or elliptic without auricled bases.
f. Spikes terete ..... 17. T. ACOSTAE
ff. Spikes more or less complanate.
g. Spikes linear-lanceolate, not over 12 mm. wide; leaf-sheaths scarcely darker than the blades, inflated ..... 18. T. BALBISIANA
gg. Spikes lance-elliptic, ovate or oblong, 12–40 mm. wide; leaf-sheaths castaneous, much darker than the blades.
h. Sepals alate; bracts subinvolucrate below the inflorescence ..... 19. T. PUNCTULATA
hh. Sepals merely carinate; bracts not at all involucrate.
i. Sides of the spikes more or less convex; floral bracts ample ..... 20. T. FASCICULATA
ii. Sides of the spikes flat; floral bracts narrow; primary bracts scarcely larger than the floral ..... 21. T. MELANOCRATER
dd. Floral bracts subchartaceous to membranaceous.
e. Leaf-sheaths inflated and forming a pseudobulb, the inner ones closely enfolding the scape.
f. Sepals exceeding the floral bracts ..... 22. T. SUBULIFERA
ff. Sepals equaling or shorter than the floral bracts.
g. Leaf-sheaths variegated ..... 23. T. BUTZII
gg. Leaf-sheaths green, concolorous or with only a narrow margin of red or purple ..... 24. T. BULBOSA
ee. Leaf-sheaths nearly flat and forming a crateriform rosette.
f. Floral bracts narrow, exposing the rhachis at anthesis.
g. Leaf-sheaths dark castaneous; floral bracts 25–35 mm. long ..... 25. T. INCURVA
gg. Leaf-sheaths green like the blades; floral bracts 20 mm. long ..... 26. T. VALENZUELANA
ff. Floral bracts broad, densely imbricate, incurved, rugulose and blackish when dry ..... 27. T. KEGELIANA

1. TILLANDSIA RUBRA R. & P. Fl. Peruv. 3:40. 1802.

Tillandsia paniculata Schlecht. & Cham. in Linnaea 6:54. 1831, non L. 1762.

Plant 1–2 m. high. Leaves many in a dense crateriform rosette, 6–10 dm. long; sheaths subelliptic, densely brown-punctulate-lepidote; blades ligulate, acuminate, to 8 cm. wide, typically subglabrous. Scape erect, stout. Scape-bracts densely imbricate, foliaceous. Inflorescence lax, ample, pinnately compound with simple or divided branches. Primary bracts like the upper scape-bracts, much shorter than the branches but much larger than the floral bracts. Spikes lanceolate, acute, complanate, dense, 1–3 dm. long, 5 cm. wide, often spreading or recurved, stipitate with sterile bracts at base. Floral bracts narrowly obovate, keeled toward the apex, glabrous, even, coriaceous at maturity, about equaling the sepals. Flowers erect, short-pedicellate. Sepals lance-oblong, 25–45 mm. long, carinate, equally subfree. Petals slightly exceeding the stamens.

Fig. 103
Tillandsia rubra

Mexico and the West Indies to Venezuela, Peru and Bolivia; apparently represented in Panama only by the following:

TILLANDSIA RUBRA var. COSTARICENSIS (Mez) Mez in Pflanzenreich, 4: Fam. 32:458. 1935.

Tillandsia paniculata Schlecht. & Cham. var. *costaricensis* Mez in DC. Monogr. Phan. 9:703. 1896.

Plant much smaller in all its parts. Leaves rather densely cinereous-lepidote beneath.

Costa Rica and Panama.

CHIRIQUÍ: Boquete, Boquete District, alt. 1150 m., *Davidson 825*.

2. TILLANDSIA EXCELSA Griseb. Fl. Brit. W. Ind. 597. 1864.

Tillandsia costaricana Mez & Werckle in Bull. Herb. Boiss. II. 3:143. 1903.

Often over 1 m. high. Leaves densely rosulate, 45 cm. long, obscurely punctulate-lepidote, light green, sometimes suffused or marked with red or purple; sheaths conspicuous, suborbicular; blades ligulate, acute, to 6 cm. wide. Scape erect, glabrous. Scape-bracts foliaceous, densely imbricate. Inflorescence barely or amply tripinnate, pyramidal, red, glabrous. Primary bracts large and foliaceous, the lower ones exceeding the branches. Secondary bracts narrowly lanceolate, slightly shorter than the spikes. Spikes lanceolate or elliptic, acute, dense, 8-flowered or usually less. Floral bracts suberect, 2 to 3 times as long as the internodes but so narrow as to expose the rhachis, acute, exceeding the sepals, convex, ecarinate, coriaceous, even or nerved. Flowers subsessile, 25–30 mm. long. Sepals linear-lanceolate, acute, 15–20 mm. long, subfree. Petals violet. Stamens included. Capsule cylindric, 3 cm. long.

Central America, Cuba, Jamaica.

BOCAS DEL TORO: Río Cricamola, between Finca St. Louis and Konkintoë, alt. ca. 10–

50 m., *Woodson, Allen & Seibert 1890.* CHIRIQUÍ: rain forest, Bajo Chorro, Boquete District, alt. 1800 m., *Davidson 282.*

3. TILLANDSIA SINGULARIS Mez & Wercklé in Bull. Herb. Boiss. II. 5:103. 1905.

Plant 3–4 dm. high. Leaves rosulate, 15–25 cm. long, obscurely punctulate-lepidote; sheaths elliptic, dark castaneous with a broad pale margin; blades ligulate, broadly rounded and apiculate, 2–3 cm. wide, green. Scape slender, erect, about equaling the leaves or shorter. Scape-bracts imbricate, lance-elliptic, apiculate, bright red. Inflorescence slenderly pyramidal, laxly bipinnate, 15–19 cm. long, glabrous, bright red. Primary bracts like the scape-bracts, about half as long as the branches. Spikes suberect to spreading, short-stipitate with no sterile bracts at base, 4–6 cm. long, laxly 6- to 11-flowered. Rhachis slender, slightly geniculate. Floral bracts elliptic, much shorter than the sepals, ecarinate, membranaceous, nerved. Flowers spreading, short-pedicellate. Sepals oblong, obtuse, subfree, 9–10 mm. long. Petals ligulate, 11–12 mm. long. Stamens included.

Fig. 104
Tillandsia singularis

Costa Rica, Panama.

COCLÉ: region north of El Valle de Antón, alt. ca. 1000 m., *Allen 2898.*

4. TILLANDSIA SUBIMBRICATA Baker in Jour. Bot. 25:304. 1887.
Tillandsia orthorhachis Mez & C. F. Baker in Bull. Torrey Bot. Club 30:435. 1903.

Fig. 105
Tillandsia subimbricata

Plant 1 m. high. Leaves many in a utriculate rosette, to 8 dm. long, densely punctulate-lepidote; sheaths ovate, large, not inflated, blades recurving, narrowly triangular, subulate-acuminate, 4 cm. wide. Scape erect, 1 cm. thick. Scape-bracts imbricate, the lower ones foliaceous with long reflexed laminae, the upper ovate and usually apiculate or with short filiform erect laminae. Inflorescence laxly compound. Branches simple or rarely the lowest divided, curved-ascending. Primary bracts like the upper scape-bracts, much shorter than the branches. Spikes linear, complanate, to 20-flowered with several sterile bracts at base, 15 cm. long, 12 mm. wide. Rhachis nearly straight, slender, glabrous. Floral bracts erect, 2 to 3 times as long as the internodes or sometimes less, exposing the rhachis, narrowly ovate, obtuse or apiculate, 18–20 mm. long, exceeding the sepals, subchartaceous, glabrous, strongly nerved. Flowers subsessile. Sepals narrowly elliptic, obtuse, equally subfree. Petals 25 mm. long, blue or lilac. Stamens included. Capsule slenderly cylindric, 3–4 cm. long.

Yucatan, Nicaragua, Panama, Cuba, Jamaica, Trinidad, Colombia.

PANAMÁ: near Punta Paitilla, *Standley 26254;* along the Corozal Road near Panamá, *Standley 26837;* Río Tapia, *Standley 28255.* INDEFINITE: *H. A. Dunn in hb. Foster 1169.*

5. TILLANDSIA COMPLANATA Benth. Bot. Voy. Sulph. 173. 1846.
Tillandsia axillaris Griseb. Fl. Brit. W. Ind. 597. 1864.

Leaves many in a dense rosette, 3–4 dm. or rarely longer, mostly exceeding the inflorescences, spotted, streaked or suffused with dark purple especially toward base; sheaths elliptic or narrowly ovate, 10–16 cm. long, densely brown-appressed-lepidote; blades ligulate, abruptly acute or subobtuse, apiculate, 3–5 cm. wide, obscurely punctulate-lepidote, soon glabrous above. Scapes many from the axils of the leaves, ascending, 1–2 mm. thick above the flattened base, glabrous. Scape-bracts many, erect, usually imbricate, narrowly lanceolate, subchartaceous, nearly or quite glabrous. Inflorescences simple, lanceolate or linear, acute, 4- to 24-flowered, to 8 cm. long, 15–20 mm. wide, usually complanate, glabrous. Floral bracts imbricate, elliptic, obtuse, 15–25 mm. long, exceeding the sepals, ecarinate, coriaceous or subcoriaceous, even or nerved, often rose to purple. Flowers subsessils. Sepals lanceolate, acute, the posterior ones carinate and usually much connate. Petals about 2 cm. long, rose, purple or blue, the blade suberect. Stamens slightly shorter than the petals. Capsule slenderly cylindric, 4 cm. long.

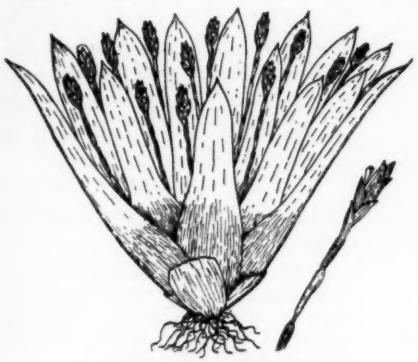

Fig. 106. *Tillandsia complanata*

Costa Rica, Panama, West Indies, British Guiana to Peru and Bolivia.

CHIRIQUÍ: vicinity of Bajo Mona and Quebrada Chiquero, alt. 1500 m., *Woodson & Schery 602;* south slope of Volcán de Chiriquí, Boquete District, alt. 3000 m., *Terry 1369.*

6. TILLANDSIA ANCEPS Lodd. Bot. Cab. *pl. 771.* 1823.
Platystachys anceps (Lodd.) Beer, Bromel. 80. 1857.
Vriesea anceps (Lodd.) Lemaire in Ill. Hortic. 6: Misc. 15. 1859.
Tillandsia xiphostachys Griseb. in Nachr. Ges. Wiss. Gött. 1864:14. 1865, in part.
Phytarrhiza anceps (Lodd.) E. Morr. in Belg. Hortic. 29:368. 1879.
Vriesea Schlechtendahlii Wittm. in Engler's Bot. Jahrb. 11:69. 1889, excl. syn.
Vriesea Schlechtendahlii var. *alba* Wittm. l. c.
Tillandsia lineatifolia Mez in DC. Monogr. Phan. 9:686. 1896.

Leaves many, densely rosulate, 15–40 cm. long, equaling or exceeding the inflorescence, densely and minutely pale-appressed-lepidote, green; sheaths triangular-ovate, red-striate; blades recurving, narrowly triangular, acuminate, 7–12 mm. wide. Scape erect, very short, stout. Scape-bracts densely imbricate, ovate, acute or the lowest with a stiff erect linear blade, much smaller than the floral bracts, coriaceous, even, glabrous. Inflorescence simple, elliptic, strongly com-

Fig. 107. *Tillandsia anceps*

planate, 10–15 cm. long, 55 mm. wide, 10- to 20-flowered, glabrous. Floral bracts densely imbricate, triangular-acute, to 4 cm. long, much exceeding the sepals, carinate, coriaceous, even, green or pale rose with greenish margins. Flowers short-pedicellate. Sepals narrowly lanceolate, acute, 3 cm. long, equally subfree, carinate. Petals more than twice as long as the sepals, the claw linear, white, the blade spreading, lance-elliptic, acute, blue or rarely white. Stamens deeply included, exceeding the style. Capsule slenderly cylindric, shorter than the sepals.

Honduras, Costa Rica, Panama, Trinidad, British Guiana, Venezuela, Colombia.

CANAL ZONE: between Frijoles and Monte Lirio, alt. 30 m., *Killip 12144*; Barro Colorado Island, *Kenoyer 215*; *Aviles 7, 13*; *Bailey 370*; *Shattuck 560*; near Río Medio, *Miller 1754*.

This species has been confused with *Tillandsia compressa* Bert., a synonym of *T. fasciculata*.

7. TILLANDSIA MONADELPHA (E. Morr.) Baker in Jour. Bot. 25:281. 1887.
Phytarrhiza monadelpha E. Morr. in Belg. Hortic. 32:168. 1882.
Tillandsia graminifolia Baker in Jour. Bot. 25:281. 1887.
Tillandsia monobotrya Mez in Fedde Rep. Spec. Nov. 16:77. 1919.
Tillandsia digitata sensu Standl. in Smithson. Misc. Coll. 78[8]:12. 1927, non Mez, 1896.

Fig. 108. *Tillandsia monadelpha*

Plant 35 cm. high. Leaves densely rosulate, 2 dm. long, obscurely punctulate-lepidote; sheaths ovate; blades very narrowly triangular, 10–15 mm. wide. Scape erect, slender, glabrous. Scape-bracts lance-elliptic, imbricate, lepidote at apex. Inflorescence simple, distichous, oblong, much compressed, about 22-flowered, lax by the spreading of the flowers, 13 cm. long. Rhachis straight, angled, thickened at the nodes. Floral bracts ovate, acute, 17 mm. long, equaling the sepals, coriaceous or subcoriaceous, carinate, striate, soon glabrous. Flowers sessile, 30 mm. long. Sepals equally short-connate, lance-elliptic, carinate, glabrous. Petals white, the blade ovate, reflexed. Stamens deeply included, exceeding the style. Capsule slenderly cylindric, 4–7 cm. long.

Central America, Colombia and Ecuador to Guiana and Trinidad.

COCLÉ: north of El Valle de Antón, near La Mesa, alt. ca. 1000 m., *Allen 2782*. CANAL ZONE: hills around the Agua Clara Reservoir, near Gatún, alt. 20–30 m., *Pittier 2658;* wet forest, Barro Colorado Island, Gatún Lake, alt. ca. 120 m., *Standley 41169;* Barro Colorado Island, *Kenoyer 214;* westerly arm of Quebrada Salamanca, alt. 75 m., *Dodge, Steyermark & Allen 17024*. DARIÉN: Cana-Cuasi Trail (Camp 2), Chepigana District, alt. 600 m., *Terry 1546*.

8. TILLANDSIA USNEOIDES L. Sp. Pl. ed. 2. 411. 1762.

Renealmia usneoides L. Sp. Pl. 287. 1753.
Tillandsia trichoides HBK. Nov. Gen. & Sp. 1:290. 1816.
Dendropogon usneoides (L.) Raf. Fl. Tellur. 4:25. 1838.
Strepsia usneoides (L.) Steud. Nomencl. Bot. ed. 2, 2:645. 1841.
Tillandsia crinita Willd. ex Beer, Bromel. 152. 1857.

Fig. 109. *Tillandsia usneoides*

Growing pendent from trees in slender branching strands up to 8 m. long. Roots absent. Stem less than 1 mm. thick, sympodial, the internodes 3–6 cm. long with only the extreme base covered by the leaves, curved. Leaves distichous, 5 cm. long, densely lepidote; sheaths elliptic, 8 mm. long; blades filiform, less than 1 mm. thick. Scape lacking. Inflorescence reduced to a single flower. Floral bract shorter than the sepals, ovate, lepidote. Sepals narrowly ovate, acute, to 7 mm. long, thin, nerved, glabrous, equally short-connate. Petals narrow, 9–11 mm. long, pale green or blue. Stamens deeply included, exceeding the pistil. Capsule cylindric, to 25 mm. long.

Virginia to Texas along the coast and south to central Argentina and Chile. "Spanish Moss" of the southeastern United States.

BOCAS DEL TORO: hillside forest, near Olivia, *Woodson & Schery 1032;* Water Valley, near Chiriquí Lagoon, *von Wedel 1454*.

9. TILLANDSIA CRISPA (Baker) Mez in DC. Monogr. Phan. 9:739. 1896.

Guzmania crispa Baker in Jour. Bot. 25:173. 1887.

Tillandsia undulifolia Mez in DC. Monogr. Phan. 9:740. 1896.
Tillandsia plicatifolia Ule in Verhandl. Bot. Ver. Brandenburg 48:144. 1907.

Fig. 110 *Tillandsia crispa*

Plant 1–3 dm. high. Leaves many, densely rosulate, finely appressed-lepidote; sheaths large, broadly elliptic, brown-lepidote; blades very narrowly triangular, undulate-crisped. Scape erect or slightly curved, slender. Scape-bracts imbricate, elliptic, somewhat inflated, apiculate or caudate, appressed-lepidote. Inflorescence simple or digitate from several spikes. Spikes oblong, 6- to 36-flowered, 3–8 cm. long, 15–25 mm. wide. Floral bracts imbricate, suborbicular, 9–15 mm. long, exceeding the sepals, inflated-convex, membranaceous, lepidote. Flowers sessile. Sepals broadly elliptic, asymmetric, coriaceous, even, sparingly lepidote or glabrous. Petals exceeding the sepals, coherent. Stamens and pistil included.

Panama, Colombia, Ecuador, Peru.

DARIÉN: Cerro de Garagará, Sambú Basin, southern Darién, alt. 500–974 m., *Pittier 5653*.

10. TILLANDSIA SPICULOSA Griseb. in Nachr. Ges. Wiss. Gött. 1864:17. 1865.

Tillandsia micrantha Baker ex Rusby in Bull. Torrey Bot. Club 29:698. 1902, non Baker, 1887.

Plant to 8 dm. high. Leaves rosulate, 3–4 dm. long, obscurely punctulate-lepidote, often irregularly purple-spotted; sheaths large, ovate, dark brown; blades ligulate, rounded and apiculate or acute, 2–4 cm. wide. Scape erect, glabrous, often much exceeding the leaves. Scape-bracts elliptic, apiculate or short-caudate, about equaling the internodes or the upper ones slightly shorter, punctulate-lepidote. Inflorescence tripinnate or if bipinnate the branches not over 7 cm. long, lax. Primary bracts narrowly ovate, apiculate, much shorter than the branches. Spikes spreading, linear, often curved, dense, to 24-flowered, 9 cm. long, 6–9 mm. wide, usually long-stipitate with sterile bracts at the base. Floral bracts broadly ovate, 6–9 or rarely 5 mm. long, equaling or slightly exceeding the sepals, convex, ecarinate, coriaceous, nearly or quite even, scantily lepidote or glabrous. Sepals asymmetric, broadly elliptic, glabrous. Petals orange or yellow. Stamens included. Capsule slenderly cylindric, 22 mm. long.

Represented in Panama only by the following:

TILLANDSIA SPICULOSA var. PALMANA (Mez) L. B. Smith in Contrib. Gray Herb. 89:14. 1930.

Tillandsia palmana Mez in Engler's Bot. Jahrb. 30: Beibl. 67:9. 1901.

Sterile bases of the branches shorter than the primary bracts. Leaves rounded and apiculate.

Costa Rica, Panama.

PANAMÁ: cloud forest, hills above Campana, alt. 600–800 m., *Allen 1878*; Cerro Campana, alt. 1000 m., *Allen 2435*.

11. TILLANDSIA ADPRESSA André, Enum. Bromel. 6. 13 Dec. 1888; in Rev. Hortic. 60:566. 16 Dec. 1888.

Catopsis Schumanniana Wittm. in Engler's Bot. Jahrb. 11:70. 1889.
Tillandsia Schumanniana (Wittm.) Mez in DC. Monogr. Phan. 9:740. 1896.

Very variable, 2–5 dm. high. Leaves many, rosulate, usually forming an ovoid pseudobulb, 15–30 cm. long, densely punctulate-lepidote, sheaths broad, dark brown; blades narrowly triangular, involute-subulate toward apex, not over 20 mm. wide, pale-lepidote. Scape erect or nearly so, lepidote. Scape-bracts ovate-oblong, long-caudate, their bases usually equaling or exceeding the internodes. Inflorescence narrow, bipinnate, of 4–12 spikes, erect to pendulous. Axis straight to geniculate, lepidote. Primary bracts narrow, attenuate to caudate, densely lepidote, usually equaling or exceeding the spikes, always at least half as long. Spikes with 8–12 distichous flowers. Floral bracts shorter than the sepals, ovate, acute, densely lepidote. Flowers sessile, spreading. Sepals scarcely over 5 mm. long, strongly asymmetric, obovate, densely lepidote. Capsule cylindric, apiculate, 20–25 mm. long.

Represented in Panama only by the following:

TILLANDSIA ADPRESSA var. TONDUZIANA (Mez) L. B. Smith in Contrib. Gray Herb. 89:8. 1930.

Tillandsia Tonduziana Mez in Engler's Bot. Jahrb. 30: Beibl. 67:9. 1901.

Inflorescence open, elongate, the spikes spreading or reflexed at maturity.

Costa Rica, Panama.

CHIRIQUÍ: rain forest, Bajo Chorro, Boquete District, alt. 1800 m., *Davidson 280.*

12. TILLANDSIA GUANACASTENSIS Standl. in Jour. Wash. Acad. 17:247. 1927.

Fig. 111
Tillandsia guanacastensis

Plant 15–20 cm. high. Leaves about 25, densely rosulate, 10–20 cm. long, densely gray-appressed-lepidote; sheaths 2–3 cm. wide, broadly ovate; blades narrowly triangular, 10 mm. wide, involute. Scape erect, largely concealed by the leaves. Scape-bracts about equaling the internodes, ovate-elliptic, apiculate, pale-lepidote. Inflorescence digitate or pinnate, from 2 to 9 spikes, equaling or slightly exceeding the leaves. Primary bracts like the scape-bracts, extending no higher than the lowest flower of the spike. Spikes densely 12- to 22-flowered, straight, nearly erect, 3–6 cm. long, about 1 cm. wide. Floral bracts 4 mm. long, distinctly shorter than the sepals, convex, ecarinate, ovate, obtuse, sparsely pale-lepidote, even, thin. Flowers sessile, nearly erect. Sepals obovate, asymmetric, 5–6 mm. long, emarginate, sparsely lepidote. Petals 6 mm. long, yellowish white. Stamens included. Capsule slenderly cylindric, 18–20 mm. long.

Costa Rica, Panama.

COCLÉ: vicinity of El Valle de Antón, alt. ca. 600 m., *Allen 2060.*

13. TILLANDSIA FLEXUOSA Sw. Prodr. 56. 1788.

Tillandsia tenuifolia sensu Jacq. Sel. Stirp. Am. 92. 1763, non L. 1762.
Tillandsia flexuosa β. *fasciata* Lindl. in Bot. Reg. 9: under *pl. 749*. 1823.
Tillandsia aloifolia Hook. Exot. Fl. *pl. 205*. 1826.
Tillandsia patens Willd. ex Schult. in R. & S. Syst. Veg. 7:1229. 1830.
Vriesea aloefolia (Hook.) Beer, Bromel. 95. 1857.
Vriesea tenuifolia Beer, Bromel. 96. 1857, in part.
Platystachys patens (Willd.) K. Koch in Ind. Sem. Hort. Berol. 1873: App. 4:5. 1874.
Tillandsia flexuosa var. *vivipara* André, Bromel. Andr. 82. 1889.

Plant 2–15 dm. high. Leaves 10–20 in a dense often subbulbous rosette, 2–5 dm. long, densely pale-appressed-lepidote, usually marked with broad white transverse bands, the outer bladeless, squamiform; sheaths ovate, very large but merging with the blade; blades narrowly triangular, about 25 mm. wide, acuminate, then abruptly acute, curved, stiff. Scape erect, slender, glabrous. Scape-bracts erect, tubular-involute, elliptic, lepidote, at least the upper ones shorter than the internodes. Inflorescence simple or very laxly bipinnate. Primary bracts like the upper scape-bracts, much shorter than the sterile bases of the axillary branches. Branches ascending, to 4 dm. long, very lax. Rhachis slender, flexuous, angled, glabrous. Floral bracts elliptic, acute, 2–3 cm. long, equaling or shorter than the sepals, ecarinate, chartaceous, nerved, lepidote. Flowers spreading. Pedicels to 7 mm.

Fig. 112. *Tillandsia flexuosa*

long. Sepals narrowly elliptic, obtuse, 2–3 cm. long, free, sparsely lepidote or glabrous. Petals tubular-erect, to 4 cm. long, white, rose or purple. Stamens exserted. Capsule slenderly cylindric, to 7 cm. long.

Southern Florida, West Indies, Panama, Colombia, Venezuela, Guiana.

PANAMÁ: Bella Vista, sea level, *Killip 12042;* near Punta Paitilla, *Standley 26248, 26262, 26263, 30794;* along the Corozal Road, near Panamá, *Standley 26838;* vicinity of Juan Franco Race Track, near Panamá, *Standley 27787;* Taboga Island, *Standley 27967;* Río Tapia, *Standley 28292;* between Las Sabanas and Matías Hernández, *Standley 31904;* Las Sabanas, *Zetek 901;* Isla Taboga, alt. ca. 0–186 m., *Woodson, Allen & Seibert 1488;* Lefevre Park, near Panamá City, *Bartlett & Lasser 16324;* wet savanna east of Panamá City, near La Jagua, *Bartlett & Lasser 16391.* CANAL ZONE: Balboa, *Standley 25499.* INDEFINITE: *Hayes.*

14. TILLANDSIA MULTICAULIS Steud. Nomencl. Bot. ed. 2, 2:688. 1841.

Tillandsia caespitosa Schlecht. & Cham. in Linnaea 6:54. 1831, non Le Conte, 1828.
Tillandsia Schlechtendalii Baker in Jour. Bot. 26:49. 1888.
Vriesea Schlechtendalii (Baker) Wittm. in Engler's Bot. Jahrb. 14: Beibl. 32:8. 1891.

Leaves many in a dense rosette, 3–4 dm. long, exceeding the inflorescences, densely but obscurely brown-punctulate-lepidote; sheaths elliptic, 12 cm. long, purple or castaneous on the inside; blades ligulate, acute and apiculate, 25–35 mm. wide. Scapes several from the axils of the leaves, erect, 5 mm. thick, glabrous. Scape-bracts distichous, imbricate, broadly elliptic, acute, incurved, carinate, 2–4 cm. long with the smallest below, glabrous, even, subcoriaceous, bright red. Inflorescences simple, lanceolate, acute, strongly complanate, 9- to 12-flowered,

Fig. 113. *Tillandsia multicaulis*

14 cm. long, 4–6 cm. wide, glabrous. Floral bracts like the scape-bracts, densely imbricate, 5 cm. long, 4 cm. wide, much exceeding the sepals, sharply carinate. Flowers subsessile. Sepals narrowly elliptic, obtuse, to 36 mm. long and 10 mm.

wide, submembranaceous, glabrous outside, punctulate-lepidote inside, free. Petals ligulate, acute, 7 cm. long, erect, blue. Stamens slightly exserted. Ovary slenderly conic.

Vera Cruz, British Honduras, Honduras, Costa Rica, Panama.

CHIRIQUÍ: vicinity of Casita Alta, Volcán de Chiriquí, alt. ca. 1500–2000 m., *Woodson, Allen & Seibert 992;* Finca Lérida to Peña Blanca, alt. 1750–2000 m., *Woodson & Schery 320;* vicinity of Boquete, alt. 1200–1500 m., *Woodson & Schery 806.*

15. TILLANDSIA FESTUCOIDES Brongn. ex Mez in DC. Monogr. Phan. 9:678. 1896. *Tillandsia caricifolia* E. Morr. ex Mez in DC. Monogr. Phan. 9:672. 1896.

Plant 20–55 cm. high. Leaves many in a dense fasciculate rosette, often ex-

Fig. 114. *Tillandsia festucoides*

ceeding the inflorescence, densely appressed-lepidote; sheaths narrowly subtriangular, conspicuous, castaneous or ferruginous; blades linear-subulate to filiform, green. Scape erect or ascending, usually slender. Scape-bracts densely imbricate, the lower foliaceous, the upper subelliptic, filiform-laminate, chartaceous, often bright red. Inflorescence densely digitate, subellipsoid or broadly pyramidal, to 17 cm. long. Primary bracts like the upper scape-bracts but the higher ones not laminate, at least their sheaths much shorter than the axillary branches. Branches arching-recurved, linear, 3–9 cm. long, complanate. Floral bracts barely imbricate, lance-ovate, acute, 17–22 mm. long, exceeding the sepals, carinate and often incurved, subcoriaceous, usually nerved, pale-appressed-lepidote to glabrous, green or red. Flowers subsessile. Sepals lanceolate, glabrous or sparsely lepidote, the posterior ones connate, 6–8 mm. long. Petals tubular-erect, 25–30 mm. long, purple. Stamens exserted. Capsule cylindric, 25–30 mm. long.

Florida, Greater Antilles, southern Mexico, Central America.

BOCAS DEL TORO: Pumpkin River, vicinity of Chiriquí Lagoon, *von Wedel 2563.*

16. TILLANDSIA JUNCEA (R. & P.) Poir. in Lam. Encycl. Suppl. 5:309. 1817.

Bonapartea juncea R. & P. Fl. Peruv. 3:38. 1802.
Misandra juncea (R. & P.) Dietr. Lex. Nachtr. 5:103. 1819.
Acanthospora juncea (R. & P.) Spreng. Syst. 2:25. 1825.
Tillandsia quadrangularis Mart. & Gal. in Bull. Acad. Brux. 10[1]:119. 1843.
Platystachys juncea (R. & P.) Beer, Bromel. 86. 1857.
Tillandsia juncifolia Regel in Gartenfl. 23:321. 1874.

Plants 2–4 dm. high, often with scaly branching rhizomes. Leaves many in a dense fasciculate rosette, usually equaling the inflorescence or shorter, densely subappressed-lepidote; sheaths triangular-ovate, conspicuous, ferruginous; blades linear-subulate, filiform-acuminate. Scape erect or ascending, stout. Scape-bracts densely imbricate, lance-elliptic, acuminate, filiform-laminate, subchartaceous, densely pale-lepidote. Inflorescence densely digitate from a few spikes or sometimes reduced to a single densely polystichous-flowered spike, ovoid, rarely over 7 cm. long. Primary bracts like the upper scape-bracts, subinvolucrate below the inflorescence, their sheaths slightly shorter than the lower axillary spikes, their blades mostly exceeding them. Spikes sessile, elliptic or lanceolate, acute, to 4 cm. long, stout, slightly complanate. Floral bracts densely imbricate, broadly ovate, exceeding the sepals, carinate in the distichous-flowered spikes, coriaceous or subcoriaceous, nearly or quite even, densely lepidote, often red. Flowers subsessile. Sepals lanceolate, acute, 15–20 mm. long, glabrous or sparsely lepidote, the posterior ones much connate. Petals tubular-erect, to 4 cm. long, violet. Stamens exserted. Capsule slenderly cylindric, 25–35 mm. long.

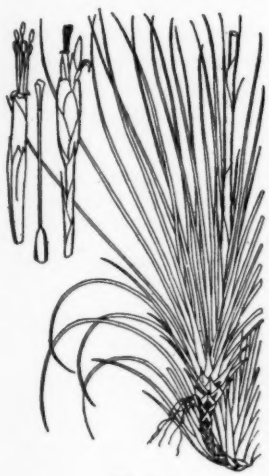

Fig. 115
Tillandsia juncea

Florida, Cuba, Jamaica, Hispaniola, southern Mexico, Central America, Trinidad and Colombia south to Peru and Bolivia.

BOCAS DEL TORO: Water Valley, *von Wedel 648*. CHIRIQUÍ: pastures around El Boquete, alt. 1000–1300 m., *Pittier 3010;* valley of the Río Caldera, from El Boquete to the Cordillera, alt. 1400–1600 m., *Killip 3511;* Bajo Mono, Boquete District, alt. 1350 m., *Davidson 467;* Finca Lérida to Boquete, alt. ca. 1300–1700 m., *Woodson, Allen & Seibert 1128*.

17. TILLANDSIA ACOSTAE Mez & Tonduz in Fedde Rep. Spec. Nov. 14:252. 1916.

Plant 20–25 cm. high. Leaves many in a dense rosette, about equaling the inflorescence, rigid, densely and minutely appressed-lepidote; sheaths elliptic-oblong, 3–4 cm. long, dark castaneous; blades narrowly triangular, acuminate, 10–15 mm. wide, involute toward apex. Scape erect, short, stout. Scape-bracts densely imbricate, foliaceous, subinflated. Inflorescence simple or of 2 subequal sessile spikes.

Primary bracts like the upper scape-bracts but not laminate, scarcely longer than the floral bracts. Spikes linear, acuminate, terete, 7–14 cm. long, 2 cm. thick. Floral bracts densely imbricate, suborbicular, apiculate, 2 cm. long, exceeding the sepals, inflated, carinate toward apex, coriaceous, even, glabrous. Flowers subsessile. Sepals lanceolate, acute, 14 mm. long, the posterior ones much connate. Petals tubular-erect, 35 mm. long. Stamens exserted.

Costa Rica, Panama.

CHIRIQUÍ: vicinity of Puerto Armuelles, alt. 0–75 m., *Woodson & Schery 823*.

18. TILLANDSIA BALBISIANA Schult. in R. & S. Syst. Veg. 7:1212. 1830.

Platystachys digitata Beer, Bromel. 84. 1857.
Tillandsia Urbaniana Wittm. in Engler's Bot. Jahrb. 11:65. 1889.
Tillandsia cubensis Gandoger in Bull. Soc. Bot. France 66:290. 1920.

Fig. 116. *Tillandsia Balbisiana*

Plant stemless, 13–65 cm. high. Leaves many, densely and minutely pale-appressed-lepidote, often purple-margined; sheaths ovate, large, inflated, forming

an ovoid or ellipsoid pseudobulb to 12 cm. long, pale-ferruginous toward base; blades abruptly spreading or recurved from the apices of the sheaths, linear, filiform-acuminate, 1 cm. wide, usually all involute. Scape erect or ascending, slender, subglabrous. Scape-bracts imbricate, elliptic with long linear spreading or reflexed blades, inflated. Inflorescence densely pinnate or subdigitate or rarely simple, slenderly fusiform or subcylindric, to 2 dm. long. Primary bracts like the upper scape-bracts, at least their sheaths shorter than the axillary spikes. Spikes sessile, strict, linear, acute, complanate, 3–12 cm. long, 12 mm. wide. Floral bracts imbricate, ovate, obtuse and apiculate but often appearing acute, 15–22 mm. long, exceeding the sepals, coriaceous, even or slightly nerved toward apex, glabrous or obscurely lepidote, ecarinate, often bright red. Flowers subsessile. Sepals lanceolate, acute, glabrous, connate posteriorly. Petals tubular-erect, obtuse, 30–45 mm. long, violet. Stamens exserted. Capsule cylindric, 4 cm. long.

Florida, Bahamas, Cuba, Jamaica, Hispaniola, Sinaloa to Veracruz and south to Panama.

CANAL ZONE: Las Cascadas Plantation, near Summit, *Standley 29679;* westerly arm of Quebrada Salamanca, alt. 70 m., *Dodge, Steyermark & Allen 17036;* vicinity of Juan Mina, Chagres River, *Bartlett & Lasser 16814.*

19. TILLANDSIA PUNCTULATA Schlecht. & Cham. in Linnaea 6:53. 1831.

Fig. 117. *Tillandsia punctulata*

Tillandsia tricolor sensu E. Morr. in Belg. Hortic. 29:162. 1879, non Schlecht. & Cham. 1831.
Tillandsia melanopus E. Morr. ex Mez in DC. Monogr. Phan. 9:680. 1896.

Plant 25–45 cm. high. Leaves many in a dense rosette, equaling or exceeding the inflorescence but usually recurved, densely and minutely appressed-lepidote; sheaths broadly ovate to elliptic-oblong, 4–8 cm. long, deep castaneous; blades narrowly triangular, filiform-acuminate but with blunt apex, 5–10 mm. wide. Scape erect. Scape-bracts foliaceous but red-brown, all linear-laminate, usually subinvolucrate below the inflorescence. Inflorescence simple and distichous-flowered or densely digitate from 2–5 spikes. Primary bracts like the scape-bracts but very short-laminate, less than half as long as the spikes. Spikes sessile, ovate or lanceolate, acute, slightly complanate, 7–10 cm. long, 25–35 mm. wide. Floral bracts densely imbricate, broadly ovate, acute, to 4 cm. long, exceeding the sepals, subinflated, carinate, coriaceous with broad membranous margin, nerved, minutely lepidote. Flowers subsessile. Sepals lance-oblong, acute, 30–35 mm. long, complicate, alate, densely and minutely lepidote. Petals tubular-erect, 4–6 cm. long, white near apex, violet below. Stamens exserted. Capsule cylindric, acute, 3 cm. long.

Southern Mexico, Central America, Surinam.

CHIRIQUÍ: 1883, *Pfau;* Volcán de Chiriquí, Boquete District, alt. 2100 m., *Davidson 965;* vicinity of Casita Alta, Volcán de Chiriquí, alt. ca. 1500–2000 m., *Woodson, Allen & Seibert 991;* vicinity of Finca Lérida, alt. 1750 m., *Woodson & Schery 226.*

20. TILLANDSIA FASCICULATA Sw. Prodr. 56. 1788.

Tillandsia fasciculata var. *latispica* Mez in DC. Monogr. Phan. 9:683. 1896.

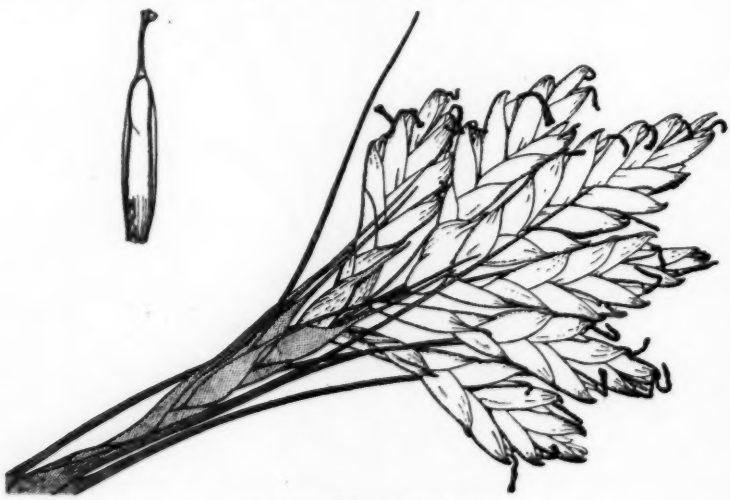

Fig. 118. *Tillandsia fasciculata*

Plant 2–10 dm. high. Leaves rosulate; sheaths large, ovate, dark castaneous; blades narrowly triangular, 2–3 cm. wide, finely lepidote. Scape erect, stout. Scape-bracts imbricate, the lower ones foliaceous. Inflorescence simple or digitate. Primary bracts broadly ovate, acuminate, shorter than the spikes. Spikes sessile or subsessile, erect, bearing reduced sterile bracts at base, usually over 1 dm. long, strongly complanate. Floral bracts imbricate, broad, acute, 2–4 cm. long, carinate, nearly or quite even, coriaceous, glabrous or subglabrous. Sepals usually shorter than the bracts, the posterior ones connate. Petals 6 cm. long, white to purple. Stamens exserted.

Florida, West Indies, Mexico to Colombia and Guiana.

PANAMÁ: near the big swamp east of Río Tecúmen, *Standley 26697, 26702.* CANAL ZONE: Maumé and Gorgona, *Wagner;* Río Paraíso, above East Paraíso, *Standley 29860;* Barro Colorado Island, *Kenoyer 211;* near Madden Dam and along Azote Caballo Road near Alahuela, alt. 90–100 m., *Dodge 16589;* westerly arm of Quebrada Salamanca, alt. 70 m., *Dodge, Steyermark & Allen 16589a.*

TILLANDSIA FASCICULATA var. CONVEXISPICA Mez in DC. Monogr. Phan. 9:683. 1896.

Spikes to 2 dm. long, only slightly complanate. Floral bracts large, even or faintly nerved.

Jamaica, Mexico, British Honduras, Guatemala, Panama.

CANAL ZONE: Barro Colorado Island, *Chickering 63.*

TILLANDSIA FASCICULATA var. UNCISPICA Mez in DC. Monogr. Phan. 9:684. 1896.

Inflorescence few-branched. Spikes short-stipitate, narrow, dense, mostly less than 1 dm. long. Floral bracts less than 25 mm. long, incurved.

Cuba, Santo Domingo, Saint Lucia, Guatemala, Panama.

BOCAS DEL TORO: Isla Colón, *von Wedel 118;* Water Valley, vicinity of Chiriquí Lagoon, *von Wedel 1377, 1396;* Little Bocas, vicinity of Chiriquí Lagoon, *von Wedel 2528.*

21. TILLANDSIA MELANOCRATER L. B. Smith in Contrib. Gray Herb. 117:31. 1937.

Tillandsia melanopus E. Morr. ex Mez in DC. Monogr. Phan. 9:680. 1896, in part, not as to type.

Plant rarely over 25 cm. high, often propagating by scaly branching rhizomes. Leaves very numerous in a subspreading rosette, 15–20 cm. long, densely and finely appressed-lepidote; sheaths broadly ovate, deep castaneous, blades curved, linear-triangular, long-acuminate, pungent, 8 mm. wide, flat. Scape erect or ascending, slender. Scape-bracts densely imbricate, broadly ovate, lepidote, at least the lower ones with a linear blade. Inflorescence simple or digitate from a few spikes. Primary bracts like the upper scape-bracts, scarcely longer than the floral bracts. Spikes variable, from narrowly oblong and acute to broadly elliptic and obtuse, 4–9 cm. long, 12–20 mm. wide, complanate with flat sides, often bearing several reduced sterile bracts toward base. Rhachis slender, nearly straight. Floral bracts imbricate but not always concealing the rhachis, ovate, 20–25 mm. long, exceeding

the sepals, carinate, coriaceous, even, glabrous or toward apex sparsely lepidote. Flowers subsessile. Sepals lanceolate, acute, 15–19 mm. long, much connate posteriorly. Petals tubular-erect, 30–35 mm. long, violet. Stamens exserted. Capsule slenderly cylindric, 3 cm. long.

Guatemala, Costa Rica, Panama.

CHIRIQUÍ: forests around El Boquete, alt. 1000–1300 m., *Pittier 2987;* Finca Lérida to Boquete, alt. ca. 1300–1700 m., *Woodson, Allen & Seibert 1129;* vicinity of El Boquete, alt. 1200–1500 m., *Woodson & Schery 807, 808.* COLÓN: forests around Porto Bello, alt. 5–100 m., *Pittier 2473.* CANAL ZONE: Las Cascadas Plantation, near Summit, *Standley 29561;* westerly arm of Quebrada Salamanca, alt. 70 m., *Dodge, Steyermark & Allen 17033;* drowned forest of Quebrada Ancha, alt. 70 m., *Dodge & Steyermark 17033a.*

Fig. 119
Tillandsia subulifera

22. TILLANDSIA SUBULIFERA Mez in Fedde Rep. Spec. Nov. 16:74. 1919.

Plant 15–19 cm. high. Leaves few in a distinct but slenderly cylindric pseudobulb, erect, the inner ones to 18 cm. long, the outer greatly reduced, appressed-canescent-lepidote, concolorous or with faint white cross-bands; sheaths about half as long as the blades, ample; blades linear, abruptly acute or obtuse, 5 mm. wide, complicate, angled. Scape erect, slender, largely concealed by the leaves. Scape-bracts imbricate, nerved, densely lepidote. Inflorescence simple, oblong or linear, 5–7 cm. long, distichously 4- to 6-flowered. Axis slender, geniculate, mostly exposed, appressed-lepidote. Floral bracts erect, elliptic, broadly acute, 2 cm. long, shorter than the sepals, incurved and somewhat carinate toward apex, nerved, appressed-lepidote. Flowers short-pedicellate. Sepals free, elliptic, narrowly obtuse, 22 mm. long, nerved, lepidote. Petals tubular-erect, 32 mm. long, yellow or white when dry. Stamens exserted. Capsule slenderly cylindric, 6 cm. long.

Trinidad, Panama.

CANAL ZONE: Las Cascadas Plantation, near Summit, *Standley 29664;* Barro Colorado Island, *Chickering 62; Shattuck 1166.*

23. TILLANDSIA BUTZII Mez in Engler, Pflanzenreich 4: Fam. 32:636. 1935.

Tillandsia variegata Schlecht. in Linnaea 18:429. 1844, non Vell. 1827.

Plant 2–3 dm. high. Leaves few in a bulbous rosette, to 5 dm. long, densely and finely pale-appressed-lepidote throughout, the margins at first ciliate with coarse scales; sheaths suborbicular, inflated, forming a pseudobulb 25–45 mm. thick, dark brown or purple with many large pale green often confluent spots; blades involute-subulate, filiform-acuminate, 3 mm. thick, contorted. Scape erect, slender. Scape-bracts foliaceous, imbricate. Inflorescence digitate from a few subequal spikes or rarely simple. Primary bracts subfoliaceous, concolorous, the broadly ovate sheath much shorter than the axillary spike, the linear blade often

much exceeding it. Spikes erect to spreading, linear, acute, complanate, 6–8 cm. long, about 1 cm. wide, 5- to 8-flowered with 1–2 sterile bracts at base. Floral bracts erect, imbricate, ovate, acute, 20–28 mm. long, much exceeding the sepals, subcoriaceous, densely lepidote, nerved. Flowers subsessile. Sepals narrowly elliptic, obtuse, 12–15 mm. long, glabrous. Petals tubular-erect, 30–35 mm. long, violet. Stamens exserted. Capsule slenderly cylindric, 3 cm. long.

Southern Mexico, Central America.

CHIRIQUÍ: pastures around El Boquete, alt. 1000–1300 m., *Pittier 3011;* trail from Paso Ancho to Monte Lirio, upper valley of Río Chiriquí Viejo, alt. 1500–2000 m., *Allen 1592.*

24. TILLANDSIA BULBOSA Hook. Exot. Fl. *pl. 173.* 1826.

Tillandsia bulbosa var. *brasiliensis* Schultes in R. & S. Syst. Veg. 7:1212. 1830.
Tillandsia bulbosa var. *picta* Hook. in Bot. Mag. *pl. 4288.* 1847.
Tillandsia inanis Lindl. & Paxt. Fl. Gard. 1:159. 1850.
Tillandsia erythraea and *T. pumila* Lindl. & Paxt. Fl. Gard. 1:160. 1850.
Platystachys inanis (Lindl.) Beer, Bromel. 82. 1857.
Platystachys bulbosa (Hook.) and *P. erythraea* (Lindl.) Beer, Bromel. 83. 1857.

Plants usually in dense masses, 7–22 cm. high. Leaves 8–15, often exceeding the inflorescence, covered with fine appressed cinereous scales; sheaths orbicular, abruptly contracted into the blades, much inflated, 2–5 cm. long, forming a dense ovoid pseudobulb, green or greenish white, often with a narrow red or purple margin; blades involute-subulate, acuminate, contorted, spreading, to 3 dm. long, 2–7 mm. thick. Scape erect. Scape-bracts with elongate foliaceous blades exceeding the inflorescence, the upper ones often red. Inflorescence simple or subdigitate from a few spikes, red or green. Primary bracts ovate, acute, much shorter than the spikes but their foliaceous blades sometimes exceeding them. Spikes spreading, lanceolate, acute, complanate, 2–5 cm. long, 2- to 8-flowered. Rhachis slender, lepidote. Floral bracts erect, imbricate, ovate, acute, 15 mm. long, exceeding the sepals, carinate, subchartaceous, lepidote. Flowers sessile. Sepals oblong, apiculate, 13 mm. long, the posterior ones somewhat connate. Petals 3–4 cm. long, blue or violet. Stamens exserted. Capsule cylindric, to 4 cm. long.

Southern Mexico, Central America, West Indies, Trinidad, Colombia, Venezuela, Guiana, Brazil.

BOCAS DEL TORO: Isla Colón, vicinity of Chiriquí Lagoon, *von Wedel 130, 1330;* Water Valley, *von Wedel 646;* Little Bocas, vicinity of Chiriquí Lagoon, *von Wedel 2537;* Darkland, vicinity of Chiriquí Lagoon, *von Wedel 2622.* COCLÉ: vicinity of Penonomé, *Williams 609.* CANAL ZONE: Las Cascadas Plantation, near Summit, *Standley 25754, 29665, 29690;* Balboa, *Standley 28569;* Brazos Brook Reservoir, *Stevens 717;* Barro Colorado Island, *Standley 40878, Aviles 27, Bailey 371, Shattuck 154, 521;* near Madden Dam and along Azote Caballo Road near Alahuela, alt. 90–100 m., *Dodge 16581;* westerly arm of Quebrada Salamanca, alt. 70 m., *Dodge, Steyermark & Allen 16581a.* INDEFINITE: *Cowell 412.*

25. TILLANDSIA INCURVA Griseb. in Nachr. Ges. Wiss. Gött. 1864:15. 1865.

Tillandsia digitata Mez in DC. Monogr. Phan. 9:715. 1896.
Tillandsia castaneo-bulbosa Mez & Wercklé in Bull. Herb. Boiss. II. 3:140. 1903.

Plant 15–40 cm. long with the inflorescence extended. Leaves many in a dense subbulbous rosette, 15–35 cm. long, very densely and finely appressed-lepidote throughout; sheaths large, distinct, broadly ovate to suborbicular, dark castaneous; blades narrowly triangular, long-acuminate, 2–3 cm. wide, cinereous-lepidote. Scape arching-decurved, slender, short. Scape-bracts barely imbricate, involute, obovate or elliptic, densely lepidote, at least the lower ones caudate. Inflorescence simple or digitate with 2–5 spikes. Primary bracts like the scape-bracts, scarcely larger than the floral bracts. Spikes strict, linear or lance-linear with several sterile bracts at base, acute, 10–24 cm. long, complanate, 7- to 16-flowered. Rhachis flexuous, slender, angled, excavated next the flowers, lepidote at first. Floral bracts erect or slightly divergent, two to three times as long as the internodes but usually exposing most of the rhachis, elliptic, obtuse, 25–35 mm. long, much exceeding the sepals, ecarinate at maturity, red, submembranaceous, nerved to almost even, appressed-lepidote to glabrous. Flowers distinctly pedicellate. Sepals free, elliptic, obtuse or apiculate, 15–20 mm. long, soon glabrous, stramineous. Petals 35 mm. long, yellow. Stamens exserted.

Southern Florida, Cuba, Jamaica, Costa Rica, Panama, Venezuela, Colombia, Bolivia.

CHIRIQUÍ: vicinity of Finca Lérida, alt. 1750 m., *Woodson & Schery 223*.

26. TILLANDSIA VALENZUELANA A. Rich. in Sagra, Hist. Cuba 11:267. 1850.

Tillandsia laxa Griseb. Fl. Brit. W. Ind. 596. 1864.
Tillandsia Kunthiana sensu Griseb. in Nachr. Ges. Wiss. Gött. 1864:15. 1865, non Gaud. 1846.
Tillandsia brachypoda Baker in Jour. Bot. 25:237. 1887.
Tillandsia sublaxa Baker in Jour. Bot. 25:280. 1887.
Tillandsia polystachya var. *alba* Wittm. in Engler's Bot. Jahrb. 11:65. 1889.
Tillandsia Purpusii Mez in Fedde, Rep. Spec. Nov. 14:251. 1916, in part.
Tillandsia domingensis Mez in Fedde, Rep. Spec. Nov. 16:73. 1919.

Plant 2–6 dm. high. Leaves many in a utriculate rosette, to 4 dm. long, the outer reduced to scale-like sheaths, very densely and finely appressed-cinereous-lepidote throughout, sometimes becoming glabrous above; sheaths large, ovate, concolorous with the blade; blades linear-triangular, acuminate, usually flat, 10–25 mm. wide. Scape central, erect or ascending, slender, glabrous. Scape-bracts imbricate, ovate, inflated, cinereous-lepidote, pink or red, fading to olivaceous, at least the lower ones with linear foliaceous blades. Inflorescence simple or pinnately compound from a few spikes. Axes slender, soon glabrous. Primary bracts like the upper scape-bracts, their sheaths much shorter than the spikes but their blades sometimes exceeding the lower ones. Spikes divergent, oblong, acute, complanate, often rather lax, 6- to 17-flowered, especially the terminal spike with sterile bracts at base, 5–20 cm. long, 1–2 cm. wide. Rhachis angled, slightly flexuous. Floral bracts erect or suberect, usually 2–3 times as long as the internodes but exposing the rhachis, elliptic-oblong, obtuse or apiculate, 2 cm. long, much exceeding the sepals, submembranaceous, nerved, subglabrous, pink or red,

sometimes carinate toward apex. Flowers subsessile. Sepals oblong, obtuse, somewhat connate posteriorly. Petals linear, 3 cm. long, lilac or violet. Stamens exserted. Capsule prismatic, 3 cm. long.

Southern Florida, Greater Antilles, southern Mexico, Central America, Colombia, Venezuela, Bolivia.

BOCAS DEL TORO: Water Valley, *von Wedel 739, 1395, 1557.* CANAL ZONE: Las Cascadas Plantation, near Summit, *Standley 29562, 29667;* near Madden Dam and along Azote Caballo Road near Alahuela, alt. 90–100 m., *Dodge.*

27. TILLANDSIA KEGELIANA Mez in DC. Monogr. Phan. 9:725. 1896.

Leaves many in a dense rosette, 12–17 cm. long; sheaths broadly ovate, over 3 cm. long, thin, castaneous-lepidote; blades often secund, involute-subulate, acuminate, 5 mm. wide, rigid, densely pale-lepidote. Scape slender, ascending, very short, glabrous. Scape-bracts densely imbricate, lance-ovate, long-caudate, appressed-lepidote. Inflorescence simple, exceeded by the leaves, densely 6- to 8-flowered, elliptic in outline, strongly complanate, 40–55 mm. long, 30–35 mm. wide. Rhachis undulate, angled, glabrous. Floral bracts suberect, densely imbricate, acuminate from a broadly elliptic base, incurved, 3 cm. long, 16 mm. wide, fleshy, bright red when fresh, minutely rugulose and blackish when dry, glabrous. Flowers erect or suberect. Pedicels short and thick. Sepals free, elliptic, obtuse, 2 cm. long, coriaceous when dry, densely punctulate-lepidote, slightly nerved. Petals over 4 cm. long, dark purple. Stamens exserted. Capsule subprismatic, over 5 cm. long.

Fig. 120. *Tillandsia Kegeliana*

Panama, Colombia, Surinam.

DARIÉN: forests around Yaviza, southern Darién, *Pittier 6583.*

3. VRIESIA Lindl.

VRIESIA Lindl. in Bot. Reg. 29: *pl. 10.* 1843. *Nomen conservandum,* non VRIESIA Hassk. 1842.

Hexalepis Raf. Fl. Tellur. 4:24. 1838.
Vriesia subgenus *Alcantarea* E. Morr. ex Mez in Mart. Fl. Bras. 3^3:516. 1894.
Neovriesia Britton in Britton & Wilson, Sci. Surv. Porto Rico 5:141. 1923.
Alcantarea Harms in Notizbl. Bot. Gart. Berlin 10:802. 1929.

Large showy mostly epiphytic herbs. Leaves densely rosulate, often banded or mottled, entire. Inflorescence simple or compound, spikes usually distichous-flowered. Floral bracts conspicuous, enfolding or concealing the bases of the flowers. Flowers subsessile or on short pedicels. Sepals free. Petals nearly or quite free, ligulate, bearing one or two scales each. Stamens included or exserted. Ovary nearly or quite superior; style elongate. Ovules many, usually caudate. Seeds fusiform with a long straight basal coma.

a. Flowers not becoming secund at anthesis.
  b. Floral bracts shorter than the sepals; inflorescence compound ..... 1. V. ALTA
  bb. Floral bracts equaling or exceeding the sepals; inflorescence simple.
    c. Floral bracts chartaceous, sharply carinate, strongly incurved toward apex ..... 2. V. HELICONIOIDES
    cc. Floral bracts coriaceous, convex and ecarinate, straight.
      d. Leaves acute, not apiculate; floral bracts barely imbricate ..... 3. V. PACHYSPATHA
      dd. Leaves broadly acute or obtuse, apiculate; floral bracts densely imbricate ..... 4. V. GLADIOLIFLORA
aa. Flowers becoming secund at anthesis.
  b. Floral bracts acute or obtuse; axis of the inflorescence smooth or sulcate but never verrucose.
    c. Floral bracts rugulose when dry, thick, coriaceous.
      d. Sepals obtuse; floral bracts obtuse or broadly subacute ..... 4. V. GLADIOLIFLORA
      dd. Sepals acute; floral bracts triangular-acute ..... 5. V. WOODSONIANA
    cc. Floral bracts not rugulose when dry.
      d. Plant 1–2 m. high; leaf-blades 8–10 cm. wide; floral bracts coriaceous ..... 6. V. SANGUINOLENTA
      dd. Plant not over 5 dm. high; leaf-blades 13–18 mm. wide; floral bracts chartaceous ..... 7. V. SUBSECUNDA
  bb. Floral bracts acuminate, carinate toward apex; axis of the inflorescence verrucose just below the nodes ..... 8. V. RINGENS

Fig. 121
Vriesia alta

1. VRIESIA ALTA (Baker) E. Morr. ex Mez in DC. Monogr. Phan. 9:617. 1896.

Tillandsia alta Baker, Handb. Bromel. 226. 1889.

Flowering plant about 2 m. high. Leaves 1 m. long, nearly 1 dm. wide, acuminate, usually incurved at apex, marked with dark purple at base. Scape very stout. Scape-bracts exceeding the internodes, subspreading, dark purple at base and green at apex. Inflorescence amply paniculate, about 1 m. long. Branches suberect, 2–6 dm. long, 10- to 15-flowered. Floral bracts ovate to suborbicular, broadly obtuse, 37 mm. long, much exceeded by the sepals, carinate but not incurved, pale green with brownish purple markings. Flowers divergent to spreading, not secund, to 125 mm. long. Pedicels very thick, 6 mm. long. Sepals elliptic, obtuse, 41 mm. long, 21 mm. wide, purple-bordered, carinate especially toward base. Petals fasciate, at first white, then yellow and finally dull red.

Jamaica, Panama.

CHIRIQUÍ: in Panama known only from material cultivated at Liége, Belgium.

2. VRIESIA HELICONIOIDES (HBK.) ex Walp. Ann. Bot. 3:623. 1852.

Tillandsia heliconioides HBK. Nov. Gen. & Sp. 1:293. 1816.
Tillandsia disticha Willd. ex Schultes in R. & S. Syst. Veg. 7:1226. 1830, in synon.
Platystachys disticha (Willd.) Beer, Bromel. 264. 1857.
Vriesia Falkenbergii Bull in Gard. Chron. II. 13:759. 1880.
Vriesia bellula Linden, Cat. 109:7. 1883.
Vriesia disticha O. Ktze. Rev. Gen. 3:304. 1898, in part, as to material cited.
Guzmania obtusata Rusby in Mem. N. Y. Bot. Gard. 7:212. 1927.

Rarely over 4 dm. high. Leaves about 2 dm. long, green above, suffused with red and sometimes spotted below; sheaths distinct, obscurely punctulate-lepidote; blades ligulate, acute or acuminate, 15–30 mm. wide, subglabrous. Scape erect, usually much shorter than the leaves. Scape-bracts densely imbricate, broadly ovate, acute. Inflorescence simple, distichous, oblong in outline, dense, 6- to 18-flowered, to 20 cm. long, 6 cm. wide, strongly complanate. Floral bracts broadly ovate and triangular-acute or subrhombic, to 45 mm. long, chartaceous, sharply carinate with the keel sigmoid in outline, bright red above the middle, greenish yellow at apex and margins. Flowers erect or suberect, subsessile, 6 cm. long. Sepals lanceolate, acuminate, 27 mm. long, thin. Petals white, linear, acute, bearing 2 ovate obtuse scales. Stamens included. Capsule 5 cm. long. Coma reddish brown.

Guatemala to Bolivia and southwestern Brazil.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *von Wedel 1131*. CANAL ZONE: Caño Quebrado, *Pittier 6670;* Las Cascadas Plantation, near Summit, *Standley 29668;* vicinity of Las Cruces, alt. 26–40 m., *Seibert 575;* Río Chilibre, tributary of Chagres River, between Juan Mina and Madden Dam, *Bartlett & Lasser 16421;* Forest Reserve, near crossing of Cruces Trail and Madden Dam Road, *Bartlett & Lasser 16457*.

Fig. 122 *Vriesia pachyspatha*

3. VRIESIA PACHYSPATHA Mez & Wercklé in Bull. Herb. Boiss. II. 4:867. 1904.

Flowering plant 5 dm. high, very stout. Leaves 10–15 in a dense rosette, 4 dm. long; blades 3 cm. wide, linear, acute, concolorous, subglabrous at maturity, coriaceous and rigid when dry. Scape erect, very stout. Scape-bracts foliaceous, strict, densely imbricate. Inflorescence simple, 20 cm. long, 75 mm. wide, rather laxly few-flowered, strongly compressed. Floral bracts barely imbricate, suborbicular or broadly ovate, broadly acute, about 6 cm. long, much exceeding the sepals, thick, coriaceous, straight, ecarinate, under a lens punctulate and transversely rugose. Flowers erect, not secund. Pedicels very short and stout. Sepals broadly elliptic, narrowly obtuse, 37 mm. long, 19 mm. wide, very thick, punctulate-lepidote, even or toward apex faintly striate.

Costa Rica, Panama.

CHIRIQUÍ: vicinity of Bajo Chorro, alt. 1900 m., *Woodson & Schery 679*.

4. VRIESIA GLADIOLIFLORA (Wendl.) Ant. in Wiener Ill. Gart.-Zeit. 5:97. 1880.

Tillandsia gladioliflora Wendl. in Hamb. Gartenz. 19:31. 1863.
Vriesia gladioliflora purpurascens Ant. in Wiener Ill. Gart.-Zeit. 5:97, *pl. 1*. 1880.
Vriesia princeps Hort. Linden ex Batal. in Gartenfl. 26:158. 1877; cf. E. Morr. in Belg. Hortic. 30:216. 1880.
Vriesia gladioliflora var. *purpurascens* Ant. Phyto-Iconogr. 23. 1884, in synon.

Fig. 123 *Vriesia gladioliflora*

Plant up to 1 m. Leaves purplish when young, becoming deep green especially above; sheaths elliptic, inconspicuous, densely lepidote with brown punctiform scales; blades ligulate, broadly acute or obtuse, apiculate, 6–8 cm. wide, glabrous above, obscurely punctulate-lepidote beneath. Scape erect, very stout. Scape-bracts imbricate, elliptic, abruptly acute. Inflorescence simple, densely many-flowered, subcylindric at anthesis, acute, 2–4 dm. long, up to 5 cm. wide. Floral bracts distichous, erect, imbricate, broadly ovate, obtuse or broadly subacute, 45–55 mm. long, ecarinate, equaling to much exceeding the sepals, three to four times as long as the internodes, coriaceous, glabrous, green, purplish toward apex, becoming buff and finely rugulose when dry. Flowers slightly or not at all secund. Pedicels short and stout. Sepals broadly elliptic, obtuse, 20–45 mm. long, coriaceous. Petals ligulate with suborbicular blade, 4–7 cm. long, bearing 2 obovate subincised scales at base. Stamens and pistil shorter than the petals.

British Honduras, Guatemala, Costa Rica, Panama, Colombia.

CANAL ZONE: Barro Colorado Island, *Shattuck 524;* westerly arm of Quebrada Salamanca, alt. 70 m., *Dodge, Steyermark & Allen 17037.*

5. VRIESIA WOODSONIANA L. B. Smith in Woodson & Seibert in Ann. Missouri Bot. Gard. 26:275, *pl. 20*. 1939.

Leaves rosulate, up to 5 dm. long; sheaths elliptic, castaneous toward base, densely punctate-lepidote; blades ligulate, 3 cm. broad, flat, rounded at apex and apiculate, concolorous, densely and minutely lepidote beneath, glabrous above. Scape erect, glabrous. Scape-bracts foliaceous, densely imbricate. Inflorescence simple, curved, rather densely few-flowered, about 15 cm. long. Floral bracts imbricate, slightly secund, broadly ovate, triangular-acute, up to 45 mm. long and 33 mm. wide, exceeding the sepals, glabrous, strongly rugose when dry, not at all carinate, dark castaneous toward base. Flowers strongly secund. Pedicels 1 cm. long, very thick. Sepals broadly ovate, acute, 35–40 mm. long, rather thin, impressed-punctulate, rugulose when dry. Petals imperfectly known, at base bearing 2 scales 1 cm. long. Stamens apparently included.

Endemic.

CHIRIQUÍ: Bajo Mona, mouth of Quebrada Chiquero, along Río Caldera, alt. ca. 1500–2000 m., *Woodson, Allen & Seibert 1029.*

6. VRIESIA SANGUINOLENTA Cogn. & Marchal, Pl. Ornem. *pl. 52.* 1874.
Tillandsia sanguinolenta (Cogn. & Marchal) Baker, Handb. Bromel. 226. 1889.
Tillandsia ingens Mez in Urb. Symb. Ant. 2:256. 1900.
Vriesea Alfarovii Mez in Fedde Rep. Spec. Nov. 14:247. 1916.
Vriesea Urbaniana Harms in Notizbl. 12:532. 1935.

Flowering plant 1–2 m. high. Leaves about 10 in a dense rosette, suberect, 6–7 dm. long, green, usually with large irregular spots of deep red especially near the base, obscurely punctulate-lepidote; sheaths ovate-elliptic, the same color as the blades and but slightly broader; blades ligulate, acute or subrounded with a long apiculus, 8–10 cm. wide. Scape erect, much exceeding the leaves, over 1 cm. thick at summit, glabrous. Scape-bracts imbricate, broadly ovate, acute or the lower ones triangular-laminate, glabrous, even, thick, coriaceous. Inflorescence simple or few-branched, up to 4 dm. long. Primary bracts like the upper scape-bracts, covering only the sterile bases of the branches. Branches suberect, secundly 11- to 15-flowered, the lateral ones 25 cm. long with 1 or 2 sterile bracts at base, the terminal one nearly 4 dm. long with a sterile base as long as the fertile and appearing like a continuation of the scape. Rhachis up to 10 mm. thick, flexuous, strongly 4-angled, glabrous, dark, its internodes narrowly obconical. Floral bracts becoming secund with the flowers, broadly elliptic to suborbicular, abruptly acute, to 5 cm. long, some and usually all more than twice as long as the internodes, glabrous, even, rigid, coriaceous, green, drying to light brown, incurved and carinate toward apex. Flowers spreading and downwardly secund. Pedicels very stout, up to 12 mm. long. Sepals broadly elliptic or ovate, obtuse or broadly acute, 30–45 mm. long, rigid, glabrous outside. Petals white, slightly exceeding the sepals, bearing 2 scales at base.

Fig. 124
Vriesia sanguinolenta

Cuba, Jamaica, Costa Rica, Panama, Colombia.

BOCAS DEL TORO: indefinite, *von Wedel 473;* Nueces Cay, vicinity of Chiriquí Lagoon, *von Wedel 2934.* PANAMÁ: top of peak among rocks, hills northeast of Hacienda La Joya, alt. 50–300 m., *Dodge, Hunter, Steyermark & Allen 16907.* CANAL ZONE: westerly arm of Quebrada Salamanca, alt. 70 m., *Dodge, Steyermark & Allen 17038.*

7. VRIESIA SUBSECUNDA Wittm. in Engler's Bot. Jahrb. 11:69. 1889.
Tillandsia subsecunda (Wittm.) Baker, Handb. Brom. 217. 1889.
Vriesea diminuta Mez & Wercklé in Bull. Herb. Boiss. II. 4:869. 1904.

Not over 5 dm. high. Leaves 20–35 cm. long, chartaceous, densely appressed-lepidote, brownish green, sometimes tinged with red or violet; blades linear, acuminate, 13–18 mm. wide. Scape slender, erect, usually exceeding the leaves. Scape-bracts imbricate, ovate or elliptic, acuminate or the upper acute, brown, submembranaceous. Inflorescence simple, densely 4- to 9-flowered, 4–9 cm. long.

Rhachis slender, flexuous, slightly angled. Floral bracts becoming secund with the flowers, broadly ovate, 26–30 mm. long, equaling the sepals at anthesis, convex, ecarinate, incurved toward apex, even, chartaceous, light brown, slightly lustrous. Flowers suberect, 28 mm. long. Pedicels very stout, 4 mm. long. Sepals elliptic, rounded and apiculate, 22 mm. long, 10 mm. wide, thin, even or nerved, glabrous outside. Petals yellow, each bearing 2 lanceolate scales near base. Stamens and pistil included.

Costa Rica, Panama.

CHIRIQUÍ: valley of the upper Río Chiriquí Viejo, vicinity of Monte Lirio, alt. 1300–1900 m., *Seibert 229*.

8. VRIESIA RINGENS (Griseb.) Harms in Notizbl. 10:801. 1929.

Tillandsia ringens Griseb. Cat. Pl. Cub. 255. 1866.
Tillandsia chagresiana Baker in Jour. Bot. 26:109. 1888.
Tillandsia Veitchii Baker, Handb. Bromel. 223. 1889.
Vriesia Veitchii E. Morr. ex Baker, l. c., nomen, in synon.
Vriesia paniculata Mez in DC. Monogr. Phan. 9:614. 1896, as *V. panniculata*, quoad *Tillandsia ringens* Griseb., non quoad *T. paniculata* L.

Very variable in size. Leaves to 9 dm. long; sheaths ovate-elliptic, mostly indistinct, brown-punctulate-lepidote; blades ligulate, acute or acuminate, 6 cm. wide, green or occasionally with a faint purplish tinge, concolorous or obscurely banded, obscurely punctulate-lepidote beneath. Scape erect, stout. Scape-bracts densely imbricate, lance-elliptic, acute, pale green. Inflorescence laxly compound or rarely simple, up to 5 dm. long. Primary bracts like the scape-bracts but thinner, much shorter than the branches. Branches suberect, secundly few-flowered, bearing several imbricate sterile bracts at base. Rhachis usually slender, verrucose just below the nodes. Floral bracts broadly ovate, acuminate, 30–65 mm. long, enfolding the flowers, exceeding the sepals of at least the lower flowers, straight, carinate toward apex, green or brownish. Flowers erect, to 8 cm. long, glabrous. Sepals elliptic, acuminate, 25–35 mm. long, 13 mm. wide, subcoriaceous, lustrous. Petals white or yellow, coiling-recurved, shorter than the stamens, flaccid, bearing 2 large spatulate acute scales at base.

Fig. 125
Vriesia ringens

West Indies, Costa Rica, Panama, Colombia.

COLÓN: Chagres, *Fendler 448*. CANAL ZONE: westerly arm of Quebrada Salamanca, alt. 70 m., *Dodge, Steyermark & Allen*. DARIÉN: rain forest, Cana-Cuasi Trail, Chepigana District, alt. 1350 m., *Terry 1527*.

4. THECOPHYLLUM André

THECOPHYLLUM André, Bromel. Andr. 107. 1889; emend Mez in Bull. Herb. Boiss. II. 3:131. 1903.

Guzmania subgenus *Thecophyllum* (André) Mez in DC. Monogr. Phan. 9:915. 1896.

Acaulescent or rarely caulescent, mostly epiphytic. Leaves entire, often conspicuously marked. Inflorescence always compound though often very depauperate, spikes with flowers polystichous or reduced to a single perfect flower, but the presence of both primary and floral bracts indicating a compound inflorescence. Branches usually aborted. Floral bracts relatively inconspicuous. Flowers perfect. Sepals free in all species of Panama. Petals free, bearing 2 scales near the base. Stamens free, included. Pistil included; style filiform.

a. Branches of the inflorescence nearly or quite aborted, with the flowers fascicled or solitary in the axils of the primary bracts.
  b. Perfect flowers solitary in the axil of each primary bract but the floral bracts indicating a compound inflorescence ..... 1. T. INSIGNE
 bb. Perfect flowers 2 in the axil of each primary bract.
  c. Leaf-blades marked with fine wavy transverse lines ..... 2. T. IRAZUENSE
  cc. Leaf-blades concolorous.
   d. Inflorescence pendulous; primary bracts yellow and scarlet; floral bracts coriaceous ..... 3. T. ORORIENSE
   dd. Inflorescence erect; primary bracts green; floral bracts membranaceous ..... 4. T. ACUMINATUM
aa. Branches of the inflorescence developed.
  b. Flowers on slender pedicels 1–2 cm. long ..... 5. T. PEDICELLATUM
 bb. Flowers sessile or subsessile ..... 6. T. CRASSIFLORUM

1. THECOPHYLLUM INSIGNE (Mez) Mez in Bull. Herb. Boiss. II. 3:131. 1903.

Guzmania insignis Mez in DC. Monogr. Phan. 9:916. 1896.

Fig. 126
Thecophyllum insigne

Long-caulescent with the flowering scape 12 cm. high, the stem 3–4 dm. in addition, simple or branched, 6 mm. thick. Leaves densely imbricate along the stem, 1–2 dm. long, fimbriate-lepidote on the margin; sheaths 3 cm. long, broad, dark castaneous; blades linear, acuminate, not over 5 mm. wide, flat, green, soon glabrous. Scape erect, very slender, distinguished from the stem only by the coloration of its bracts. Scape-bracts imbricate, bright red, lanceolate with an elongate linear-acuminate green blade. Inflorescence laxly few-flowered, 4–9 cm. long, glabrous. Primary bracts like the scape-bracts but at least the upper ones wholly red, exceeding the sepals. Branches 1-flowered, slender, 2–3 mm. long, about as long as the pedicels and distinguished from them only by the position of the floral bracts. Floral bracts 2 on each branch, one sometimes bearing a much-reduced sterile flower, elliptic, obtuse, 5 mm.

long, thin. Flowers usually secund. Sepals elliptic, obtuse, 8–9 mm. long, free, coriaceous, red. Petals obovate, obtuse, 13–15 mm. long, dark purple. Stamens and pistil included. Capsule ovoid, acute, short.

Costa Rica, Panama.

CHIRIQUÍ: Mount Chiriquí, *Pfau 229*. COCLÉ: north of El Valle de Anton, trail to Las Minas, alt. ca. 1000 m., *Allen 2885*.

2. THECOPHYLLUM IRAZUENSE Mez & Wercklé in Bull. Herb. Boiss. II. 3:138. 1903.

Stemless, 7–10 dm. or higher. Leaves many, rosulate, erect, up to 4 dm. long; sheaths large, densely and minutely pale-lepidote, dark red-brown at base; blades subligulate, acute, 4–7 cm. wide, reddish violet, very densely marked with faint wavy transverse lines, apex recurved. Scape stout, glabrous. Scape-bracts erect, involute, exceeding the internodes, ovate-elliptic, caudate, subinflated. Inflorescence dense, slenderly cylindric, 15–30 cm. long, 4–6 cm. thick, glabrous. Primary bracts reflexed with spirally revolute apex, like the scape-bracts, the lower ones longer than the flowers. Branches very short or wholly aborted. Floral bracts suborbicular or reniform, 8–15 mm. long, obtuse, scarcely carinate, thin. Flowers 2 in each axil. Sepals broadly elliptic, 15–20 mm. long, 10–15 mm. wide, thick, coriaceous, free.

Costa Rica, Panama.

CHIRIQUÍ: rain forest, Bajo Chorro, Boquete District, alt. 1800 m., *Davidson 281*.

3. THECOPHYLLUM ORORIENSE (Mez) Mez in Bull. Herb. Boiss. II. 3:131. 1903. *Guzmania Ororiensis* Mez in DC. Monogr. Phan. 9:917. 1896.

Stemless, 5–8 dm. high. Leaves many, suberect, densely rosulate, 35–55 cm. long; sheaths large, ovate, castaneous; blades subobtuse and apiculate, 5–6 cm. wide, soon glabrous above, punctulate beneath with brownish purple scales. Scape decurved, very stout, equaling or longer than the leaves. Scape-bracts exceeding the internodes, very broadly ovate with a triangular acute blade, recurved or spirally involute toward the apex or rarely suberect, subinflated. Inflorescence many-flowered, densely cylindric especially toward apex, up to 2 dm. long, 65 mm. in diameter, glabrous. Primary bracts broadly triangular-ovate, exceeding the 2 flowers in each axil, recurved, yellow at base, bright scarlet toward apex. Branches almost wholly aborted. Floral bracts suborbicular, 12 mm. long, exceeded by the sepals, carinate, coriaceous, thick. Pedicels short and thick. Sepals obovate, 20 mm. long, 15 mm. wide, free. Petals 3 cm. long, yellow, bearing 2 large acuminate scales at base. Stamens included.

Fig. 127
Thecophyllum ororiense

Costa Rica, Panama.

CHIRIQUÍ: Finca Lérida to Peña Blanca, alt. 1750–2000 m., *Woodson & Schery 321.*

4. THECOPHYLLUM ACUMINATUM L. B. Smith in Contrib. Gray Herb. 117:30. 1937.

Fig. 128
Thecophyllum acuminatum

Stemless or short-caulescent, 24–35 cm. high. Leaves many in a dense cyathiform rosette, 15 cm. long; sheaths 5 cm. long, dark castaneous; blades ligulate, acuminate, flat, 15 mm. wide, green. Scape erect, slender. Scape-bracts foliaceous, densely imbricate. Inflorescence densely subcapitate, 35 mm. long, 75 mm. in diameter. Primary bracts ovate, acuminate, green, much exceeding the flowers, the lower ones with 2 flowers in each axil. Branches aborted. Floral bracts broadly elliptic, up to 12 mm. long, exceeded by the sepals, membranaceous, densely brown-punctulate. Flowers subsessile. Sepals broadly elliptic, obtuse, 14 mm. long, 11 mm. wide, thin-coriaceous, brown-punctulate.

Costa Rica, Panama.

COCLÉ: north of El Valle de Antón, trail to Las Minas, alt. ca. 1000 m., *Allen 2884.* PANAMÁ: summit of Cerro Campana, alt. 800–1000 m., *Allen 2215.*

5. THECOPHYLLUM PEDICELLATUM Mez & Wercklé in Bull. Herb. Boiss. II. 3:136. 1903.

Stemless, 5–9 dm. high. Leaves many, 30–65 cm. long; sheaths large, dark brown toward base, coarsely pale-appressed-lepidote toward apex; blades ligulate, acute or subobtuse, 25–90 mm. wide. Scape stout, about equaling the leaves. Scape-bracts erect, mostly imbricate. Inflorescence cylindric, 25–50 cm. long, glabrous. Primary bracts lance-ovate, exceeded at least by the flowers. Branches from rather short in the Costa Rican specimens to 10 cm. long in the Panamanian, erect, slender, lax. Floral bracts membranaceous, shorter or longer than the pedicels. Flowers spreading, often secund. Pedicels slender, 1–2 cm. long. Sepals broadly obovate, asymmetric, obtuse, 7–11 mm. long, convex, ecarinate, coriaceous, even, free. Petals oblanceolate, obtuse, 15 mm. long. Capsules slenderly ellipsoid, acuminate, 25 mm. long.

Fig. 129
Thecophyllum pedicellatum

Costa Rica, Panama.

CHIRIQUÍ: rain forest, Bajo Chorro, Boquete District, alt. 1800 m., *Davidson 307.*

The single Panamanian specimen has much larger leaves, branches and floral bracts than are usual, but it is too old to show whether these are supported by other characters which would distinguish it specifically.

6. THECOPHYLLUM CRASSIFLORUM Mez & Wercklé in Bull. Herb. Boiss. II. 3:138. 1903.

Plant 1 m. high. Leaves 5–6 dm. long; sheaths elliptic, inconspicuous; blades ligulate, acuminate, 4 cm. wide, green, concolorous. Scape stout, 5 dm. long. Scape-bracts exceeding the internodes, the lower ones erect, narrowly triangular, the upper ones elliptic-ovate with short reflexed blades. Inflorescence densely cylindric but interrupted at base, 2–3 dm. long, 4 cm. thick. Primary bracts suberect with bright red recurved apices, broadly ovate, triangular-acute, inflated, the lower ones exceeding the flowers. Floral bracts strongly asymmetric, obliquely truncate, 12 mm. long, 8 mm. wide, coriaceous, subglabrous. Flowers 1 or 2 in the axil of each primary bract, sessile or subsessile, 30 mm. long. Sepals subelliptic, obtuse, asymmetric, 16 mm. long, 14 mm. wide, thick, coriaceous, even, dull.

Fig. 130
Thecophyllum crassiflorum

Costa Rica, Panama.

CHIRIQUÍ: Potrero Muleto to summit, Volcán de Chiriquí, alt. 3500–4000 m., *Woodson & Schery 453*.

5. GUZMANIA R. & P.

GUZMANIA R. & P. Fl. Peruv. 3:37. 1802.

Caraguata Lindl. in Bot. Reg. 13: under *pl. 1068*. 1827.
Davillea Bertero ex Schultes in R. & S. Syst. Veg. 7:1229. 1830, in synon.
Massangea E. Morr. in Belg. Hortic. 27:59, 199. 1877.
Sodiroa André in Bull. Soc. Bot. France 24:167. 1877.
Schlumbergera E. Morr. in Belg. Hortic. 33:46. 1883, non *Schlumbergera* Lemaire, 1858.
Chirripoa Suessenguth in Engler's Bot. Jahrb. 72:293, *pl. 4, Abb. 11*. 1942.

Plant usually stemless and epiphytic. Leaves entire, the sheaths usually conspicuous. Inflorescence simple or compound, the spikes always polystichous-flowered. Flowers perfect. Sepals usually connate. Petals connate or closely agglutinated, naked, yellow or white. Stamens usually included, the filaments appearing more or less fused to the petals. Ovary wholly superior, glabrous. Ovules numerous. Capsule septicidal. Seeds with a long basal straight usually brownish coma.

a. Inflorescence simple.
  b. Inflorescence cyathiform, the outer bracts much enlarged, red ..... 1. G. MINOR
  bb. Inflorescence not cyathiform, the outer bracts relatively inconspicuous.
    c. Sepals connate for much less than half their length; floral bracts imbricate, exceeding the sepals.
      d. Floral bracts membranaceous.
        e. Inflorescence cylindric; sepals coriaceous ..... 2. G. MONOSTACHIA
        ee. Inflorescence fusiform; sepals membranaceous.
          f. Leaf-blades not over 10 mm. wide; plant more or less caulescent; inflorescence sterile toward apex ..... 3. G. ANGUSTIFOLIA

ff. Leaf-blades 20–25 mm. wide; plant stemless; inflorescence fertile throughout ..... 4. G. NICARAGUENSIS
dd. Floral bracts coriaceous, lustrous ..... 5. G. CORIOSTACHYA
cc. Sepals connate for more than half their length; floral bracts equaling or shorter than the sepals and enfolding them, not imbricate.
d. Inflorescence very lax; leaf-blades with fine brown stripes ..... 6. G. DISSITIFLORA
dd. Inflorescence densely subglobose; leaf-blades with fine wavy transverse lines ..... 7. G. MUSAICA
aa. Inflorescence compound.
b. Floral bracts equaling or exceeding the sepals; spikes densely strobilate.
c. Inflorescence short and compact; the spikes pressed together ..... 8. G. GLOMERATA
cc. Inflorescence elongate and interrupted ..... 9. G. POLYCEPHALA
bb. Floral bracts shorter than the sepals.
c. Branches dense, not much over 4 cm. long at most.
d. Inflorescence digitate, subcorymbose ..... 10. G. SUBCORYMBOSA
dd. Inflorescence cylindric to pyramidal.
e. Sepals twisted into a slender tube; primary bracts bright red ..... 11. G. DONNELLSMITHII
ee. Sepals forming an ellipsoid; primary bracts and the rest of the inflorescence bright yellow ..... 12. G. ZAHNII
cc. Branches lax, 10–12 cm. long; sepals connate for 10 mm. ..... 13. G. GUATEMALENSIS

1. GUZMANIA MINOR Mez in DC. Monogr. Phan. 9:901. 1896.

Leaves many, densely rosulate, suberect, 3 dm. long, exceeding the inflorescence; sheaths distinct, ovate, punctate-lepidote; blades ligulate, acute or acuminate with a caudate apex, 25 mm. wide or less, glabrous above, obscurely punctate-lepidote beneath. Scape very short, glabrous. Scape-bracts densely imbricate, elliptic-lanceolate, acuminate, 65 mm. long, the lower green, the upper bright red and forming a showy involucre exceeding the flowers. Inflorescence simple, few-flowered, corymbiform. Floral bracts like the upper scape-bracts but slightly cucullate, smaller and thinner. Flowers 35 mm. long. Pedicels short. Sepals linear-oblong, acute, free. Petals linear, obtuse, white, agglutinated for most of their length. Stamens about equaling the petals, high-connate. Capsule sub-prismatic, about 3 cm. long.

Nicaragua, Costa Rica, Panama, Brazil.

BOCAS DEL TORO: *von Wedel 213;* hills behind Fish Creek, vicinity of Chiriquí Lagoon, *von Wedel 2208;* Shepherd Island, vicinity of Chiriquí Lagoon, *von Wedel 2738.* COCLÉ: El Valle de Antón and vicinity, alt. 500–700 m., *Seibert 455;* mountain forest, vicinity of El Valle, *Bartlett & Lasser 16677, 16703.* PANAMÁ: Cerro Campana, alt. 1000 m., *Allen 2431.* CANAL ZONE: Matachin, *Kuntze 1938;* Caño Quebrado, *Pittier 6687;* headwaters of the Río Chinilla, above Nuevo Limón, *Maxon 6881;* hills north of Frijoles, *Standley 27458;* Barro Colorado Island, *Standley 31376, 40879, 41039, Kenoyer 213, Bailey 39;* westerly arm of Quebrada Salamanca, alt. 70 m., *Dodge, Steyermark & Allen 17034.* DARIÉN: Cana-Cuasi Trail (Camp 2), Chepigana District, alt. 600 m., *Terry 1429.*

2. GUZMANIA MONOSTACHIA (L.) Rusby ex Mez in DC. Monogr. Phan. 9:905. 1896.

Renealmia monostachia L. Sp. Pl. 287. 1753.
Tillandsia monostachia L. Sp. Pl. ed. 2. 410. 1762.
Tillandsia clavata Lam. Encyc. 1:617. 1785.
Pourretia sympaganthera R. & P. Syst. Veg. Fl. Peruv. 1:82. 1789.

Guzmania tricolor R. & P. Fl. Peruv. 3:38, *pl. 261.* 1802.
Guzmania comosa Bertero ex Schultes in R. & S. Syst. Veg. 7:1232. 1830.
Guzmania sympaganthera (R. & P.) Beer, Bromel. 103. 1857.
Tillandsia pachycarpa Baker in Jour. Bot. 25:238. 1887.
Tillandsia gymnophylla Baker in Jour. Bot. 26:41. 1888.
Guzmania platysepala Mez & C. F. Baker in Bull. Torr. Bot. Club 30:437. 1903.
Guzmania clavata (Lam.) Urb. in Fedde Rep. Spec. Nov. 15:99. 1917.

Fig. 131. *Guzmania monostachia*

Stemless, 2–4 dm. high. Leaves many, soon glabrous; sheaths broadly ovate, brownish; blades ligulate, acute, 2 cm. wide, yellow-green. Scape erect, short. Scape-bracts imbricate, ovate, acute, pale green. Inflorescence simple, cylindric, acute, 8–15 cm. long, 2–3 cm. thick, sterile toward apex. Floral bracts imbricate, ovate, acute, membranous, the fertile ones pale with brown stripes, about equaling the flowers, the sterile bright red. Flowers 23–29 mm. long. Sepals 18 mm. long, obovate, broadly obtuse, coriaceous, equally connate for about one fourth their length. Petals white, high-connate, the lobes elliptic, obtuse. Capsule cylindric, 2–3 cm. long. Coma white.

Southern Florida, West Indies, Nicaragua, Costa Rica, Panama, northwestern South America.

BOCAS DEL TORO: Río Cricamola between Finca St. Louis and Konkintoë, alt. ca. 10–50 m., *Woodson, Allen & Seibert 1891;* Isla Colón, *von Wedel 70;* indefinite, *von Wedel 214a;* Water Valley, vicinity of Chiriquí Lagoon, *von Wedel 1706;* hills behind Fish Creek, vicinity of Chiriquí Lagoon, *von Wedel 2448.* CANAL ZONE: *Werner 53;* Las Cascadas Plantation, near Summit, *Standley 29691;* Barro Colorado Island, *Bailey 105, Shattuck 763, Aviles 927;* westerly arm of Quebrada Salamanca, alt. 70 m., *Dodge, Steyermark & Allen 17032, 17035;* Río Chilibre, tributary of Chagres River between Juan Mina and Madden Dam, *Bartlett & Lasser 16422.*

3. GUZMANIA ANGUSTIFOLIA (Bak.) Wittm. in Engler's Bot. Jahrb. 11:62. 1889.

Caraguata angustifolia Baker in Gard. Chron. II. 22:616. 1884.
Guzmania Bulliana André in Rev. Hortic. 58:324. 1886.
Guzmania caulescens Mez & Sodiro in Bull. Herb. Boiss. II. 5:112. 1905.

Stem from quite short to about 2 dm. long. Leaves densely imbricate, 8–30 cm. long, green above, purplish beneath; sheaths distinct, elliptic, densely brown-punctulate; blades linear-triangular, acuminate, 10 mm. wide, suberect or somewhat spreading, punctulate-lepidote. Scape slender, short. Inflorescence simple, few-flowered, thick-fusiform, up to 65 mm. long and 40 mm. thick, sterile toward apex. Floral bracts ample, ovate-elliptic, acute or subacuminate, erect, barely shorter than the petals at anthesis, membranaceous, bright red with dark tips.

Fig. 132. *Guzmania angustifolia*

Flowers subsessile. Sepals elliptic, obtuse, 15–20 mm. long, membranaceous, glabrous, connate for 3 mm. Petals bright yellow, 7 cm. long, connate in a slender tube for 6 cm., the free lobes subelliptic, obtuse. Stamens included; filaments connate with the petals for nearly their whole length. Capsule prismatic, acute, 28 mm. long.

Costa Rica, Panama, Colombia, Ecuador.

CHIRIQUÍ: Mount Chiriquí, *Pfau 230* (Mez!). DARIÉN: Mount Pirrí, alt. 1500 m., *Goldman 1882;* Cana-Cuasi Trail, Real District, alt. 1650 m., *Terry 1544, 1579, 1598.*

4. GUZMANIA NICARAGUENSIS Mez & C. F. Baker in Bull. Torrey Bot. Club 30:436. 1903.

Guzmania bracteosa sensu Donn. Smith in Bot. Gaz. 47:262. 1909, non André ex Mez.

Fig. 133
Guzmania nicaraguensis

Leaves 10–15 in a dense cyathiform rosette, 3–6 dm. long, usually much exceeding the inflorescence, densely pale-appressed-lepidote beneath, often red-striped; sheaths ovate, 1 dm. long, castaneous toward base; blades ligulate, acute, apiculate, 20–25 mm. wide. Scape erect. Scape-bracts densely imbricate, the lower foliaceous, the upper broadly elliptic, apiculate, subinflated, bright red to reddish brown. Inflorescence simple, densely fusiform, few-flowered, fertile throughout, 7–10 cm. long, glabrous. Floral bracts like the upper scape-bracts but not apiculate, 5 cm. long, membranaceous. Flowers short-pedicellate. Sepals subelliptic, broadly obtuse, to 25 mm. long, membranaceous, short-connate. Petals connate into a slender tube for most of their length, over 6 cm. long, yellow, the free lobes elliptic, obtuse. Stamens barely included, the filaments highly connate with the petals.

Guatemala, Nicaragua, Costa Rica, Panama.

COCLÉ: north of El Valle de Antón, near La Mesa, alt. ca. 1000 m., *Allen 2803.*

5. GUZMANIA CORIOSTACHYA (Griseb.) Mez in DC. Monogr. Phan. 9:914. 1896.

Caraguata coriostachya Griseb. in Nachr. Ges. Wiss. Gött. 1864:21. 1865.
Tillandsia nigrescens André, Enum. Bromel. 8. 13 Dec. 1888; in Rev. Hortic. 60:568. 16 Dec. 1888.
Guzmania strobilifera Mez & Wercklé in Bull. Herb. Boiss. II. 5:110. 1905.

Fig. 134
Guzmania coriostachya

Plant 4–10 dm. high. Leaves rosulate, suberect, 3–6 dm. long; sheaths narrowly ovate, very finely brown-lepidote, castaneous toward base; blades ligulate, acute to acuminate, 15–30 mm. wide, glabrous above, very obscurely lepidote beneath. Scape erect, 5–8 mm. thick. Scape-bracts densely imbricate, the lower subfoliaceous, the upper ovate with triangular apex. Inflorescence simple, strobilate, many-flowered, ovoid or cylindric, 5–8 cm. long, 2–3 cm. thick, glabrous. Floral bracts erect, suborbicular with a broadly triangular obtuse apex, ecarinate, 12–18 mm. long, coriaceous, even, lustrous, bright red, drying pale to castaneous. Flowers subsessile. Sepals ovate, obtuse, 13–16 mm. long. Corolla white, 6–10 mm. longer than the sepals, its lobes elliptic, obtuse.

Costa Rica, Panama, Colombia, Venezuela.

COCLÉ: hills north of El Valle, *Allen 2945*.

6. GUZMANIA DISSITIFLORA (André) L. B. Smith in Contrib. Gray Herb. 104:74. 1934.

Sodiroa dissitiflora André, Enum. Bromel. 5. 13 Dec. 1888; in Rev. Hortic. 60:565. 16 Dec. 1888.

Usually stoloniferous, 4–9 dm. high. Leaves rosulate, suberect, 3–9 dm. long; sheaths elliptic, dark castaneous at base, the rest pale green with fine brown stripes, densely and finely lepidote; blades linear, acuminate, 7–12 mm. wide, obscurely lepidote beneath. Scape erect, 3–5 mm. thick. Scape-bracts imbricate, the lower foliaceous, the upper elliptic, acute, glabrous, bright red. Inflorescence simple, very lax, 7- to 12-flowered. Axis nearly straight, slender. Floral bracts like the upper scape-bracts, usually shorter than the sepals and closely enfolding them. Flowers spreading. Pedicels slender, 5–8 mm. long. Sepals 3–5 cm. long, thin, glabrous, connate into a slender tube for more than half their length, the free segments oblong, obtuse. Petals white when dry. Capsule slenderly cylindric, equaling the sepals.

Fig. 135
Guzmania dissitiflora

Costa Rica, Panama, Colombia.

COCLÉ: vicinity of El Valle de Antón, alt. ca. 600 m., *Allen 2055*; vicinity of La Mesa, north of El Valle de Antón, alt. 1000 m., *Allen 2383, 2786*.

7. GUZMANIA MUSAICA (Linden & André) Mez in DC. Monogr. Phan. 9:898. 1896.

Tillandsia musaica Linden & André in Ill. Hortic. 20:171. 1873.
Billbergia musaica (Linden & André) Regel in Gartenfl. 23:378. 1874.

Vriesea musaica (Linden & André) Cogn. & March. in Dallière, Pl. Ornem. 2:*pl. 39.* 1874.
Caraguata musaica (Linden & André) André in Ill. Hortic. 24:27, *pl. 268.* 1877.
Massangea musaica (Linden & André) E. Morr. in Belg. Hortic. 27:59, 199, *pl. 8–9.* 1877.

Plant 3–5 dm. high, usually spreading by elongate scaly rhizomes. Leaves 15–20 in a spreading rosette, to 7 dm. long, marked especially beneath with fine irregular transverse purple-brown lines, obscurely punctulate-lepidote; sheaths short and indistinct, castaneous toward base; blades ligulate, broadly acute or rounded, apiculate, 4–8 cm. wide. Scape erect, somewhat shorter than the leaves. Scape-bracts densely imbricate, broadly elliptic, acute or acuminate, subinflated, bright rose. Inflorescence simple, dense, subglobose, 12- to 25-flowered, glabrous. Floral bracts broadly obovate, apiculate, about half as long as the sepals and enfolding the base of the flower, coriaceous, bright rose. Flowers subsessile. Sepals 25–45 mm. long, oblong, obtuse, cucullate, highly connate, coriaceous, yellowish. Petals included at anthesis, highly connate. Stamens shorter than the petals.

Fig. 136. *Guzmania musaica*

Panama, Colombia.

COCLÉ: north of El Valle de Antón, near La Mesa, alt. ca. 1000 m., *Allen 2781.* DARIÉN: rain forest, north slope of divide, Cana-Cuasi Trail, Real (?) District, alt. 1650 m., *Terry 1608.*

8. GUZMANIA GLOMERATA Mez & Wercklé in Fedde Rep. Spec. Nov. 14:256. 1916.

Fig. 137
Guzmania glomerata

Flowering plant nearly 1 m. high, propagating by stout scaly rhizomes. Leaves up to 20 in a dense rosette, erect, coriaceous, 8 dm. long; sheaths broadly elliptic, deep castaneous; blades subglabrous, wholly green, 30 mm. wide. Scape erect, stout. Scape-bracts with castaneous base and short acute erect blade, imbricate. Inflorescence erect, densely capitate from about 10 spikes, 65 mm. thick. Primary bracts broadly ovate, shorter than the spikes, brown. Spikes densely strobiliform, very short-stipitate, suberect, stout, 45 mm. long. Floral bracts elliptic, acute, equaling or slightly exceeding the sepals, submembranaceous. Flowers glabrous. Pedicels 3 mm. long. Sepals lanceolate, acute, 22 mm. long.

Costa Rica, Panama.

COCLÉ: north rim of El Valle de Antón near Cerro Turega, alt. 650–700 m., *Woodson & Schery 199.* DARIÉN: Cana-Cuasi Trail (Camp 2), Chepigana District, alt. 600 m., *Terry 1528.*

Plants are identified from the description with which they agree closely except that their sepals appear only slightly connate (10 mm. in the description).

9. GUZMANIA POLYCEPHALA Mez & Wercklé in Fedde Rep. Spec. Nov. 14:254. 1916.

Chirripoa solitaria Suessenguth in Engler's Bot. Jahrb. 72:293, *pl. 4, Abb. 11.* 1942.

Over 1 m. high. Leaves 5–10 dm. long; sheaths small, dark castaneous; blades acuminate, to 45 mm. wide, green, subglabrous, rigidly coriaceous. Scape stout. Scape-bracts foliaceous, strict, densely imbricate. Inflorescence many-flowered, cylindric, laxly bipinnate, 3–4 dm. long. Primary bracts broadly ovate, the lower ones suberect, exceeding the spikes and with a long acuminate apex, the upper spreading, equaling or shorter than the spikes and apiculate. Spikes densely strobilate, globose, 20- to 25-flowered, 4–6 cm. long, the lower short-stipitate, the upper sessile. Floral bracts broadly elliptic, emarginate, exceeding the sepals, convex, coriaceous, nerved, glabrous. Pedicels short. Sepals obtuse, 16 mm. long, connate for 2 mm., coriaceous.

Costa Rica, Panama.

CHIRIQUÍ: valley of the upper Río Chiriquí Viejo, vicinity of Monte Lirio, alt. 1300–1900 m., *Seibert 208*.

10. GUZMANIA SUBCORYMBOSA L. B. Smith in Contrib. Gray Herb. 117:10. 1937.

Guzmania compacta sensu L. B. Smith in Contrib. Gray Herb. 98:32. 1932, non Mez.

Fig. 138
Guzmania subcorymbosa

Plant 3–6 dm. high. Leaves many in a dense cyathiform rosette, usually with fine purple stripes toward base; sheaths ovate, 7 cm. long, densely brown-punctulate, often castaneous toward base; blades linear-triangular, acuminate, 10–15 mm. wide, glabrous above, obscurely punctulate below. Scape erect, slender. Scape-bracts densely imbricate, foliaceous. Inflorescence digitate, subcorymbose, green. Primary bracts ovate, acute, half as long as the axillary spikes, coriaceous, even. Spikes subellipsoid, sessile or subsessile, dense, 3- to 10-flowered, 25–40 mm. long. Floral bracts ovate, broadly acute or obtuse, shorter than the sepals, coriaceous, even, ecarinate, subglabrous. Flowers subsessile. Sepals elliptic, acute, 10–12 mm. long, short-connate, carinate, coriaceous. Petals white. Capsule cylindric, 3 cm. long. Coma red-brown.

Costa Rica, Panama, Colombia.

CANAL ZONE: Gatún. Cultivated material collected by *Corbett* in 1914.

11. GUZMANIA DONNELLSMITHII Mez ex Donn. Smith in Bot. Gaz. 35:9. 1903.

Thecophyllum angustum Mez & Wercklé in Bull. Herb. Boiss. II. 4:1121. 1904.

Plant stemless. Leaves about 15, suberect, 4–6 dm. long, exceeding the in-

florescence; sheaths large, ovate or elliptic, forming a slender pseudobulb, densely brown-lepidote, often finely purple-striped; blades ligulate, acuminate, 2–3 cm. wide, concolorous, pale-lepidote, green. Scape erect, slender. Scape-bracts densely imbricate, foliaceous. Inflorescence densely bipinnate, cylindric, 11–13 cm. long, 4 cm. thick. Primary bracts suberect to spreading, broadly ovate, inflated, bright red, punctulate-lepidote, thin, the lower ones exceeding the flowers and with long acuminate blades. Branches densely 2- to 3-flowered, stipitate, rhachis 10–12 mm. long. Floral bracts suborbicular to reniform, 6–10 mm. long, ecarinate, thin, glabrous, red. Flowers erect. Pedicels very short and stout. Sepals nearly or quite free but twisted into a slender tube, narrow, obtuse, 16–20 mm. long, coriaceous, subglabrous. Petals conglutinated, naked, obtuse, erect, slightly exceeding the sepals. Stamens included.

Fig. 139 *Guzmania Donnellsmithii*

Costa Rica, Panama.

BOCAS DEL TORO: hills behind Fish Creek, vicinity of Chiriquí Lagoon, *von Wedel 2333*. COCLÉ: north rim of El Valle de Antón, alt. 600–1000 m., *Allen 1645;* vicinity of La Mesa, north of El Valle de Antón, alt. 1000 m., *Allen 2382, 2802*.

12. GUZMANIA ZAHNII (Hook. f.) Mez in DC. Monogr. Phan. 9:940. 1896.

Caraguata Zahnii Hook. f. in Bot. Mag. 99:*pl. 6059*. 1873.

Fig. 140. *Guzmania Zahnii*

Stemless or slightly caulescent and branching, about 5 dm. high. Leaves 20 to 30, suberect to spreading, 6 dm. long; sheaths indistinct, obscurely brown-lepidote, flavous with dark red stripes; blades ligulate, acuminate, 27 mm. long, thin, glabrous at maturity, wholly purple-red or green near apex, with red-brown stripes dorsally or on both sides. Scape erect, glabrous, red. Scape-bracts densely imbricate, narrowly lanceolate, acuminate, glabrous, bright scarlet. Inflorescence densely bipinnate, pyramidal or short-thyrsoid, up to 25 cm. long and 10 cm. thick, glabrous, bright yellow throughout. Primary bracts broadly ovate with acuminate lamina, the lower ones purple-tipped and exceeding the spikes. Spikes suberect to spreading, the lower distinctly stipitate, subcapitate, 5- to 12-flowered. Floral bracts broadly elliptic or suborbicular, obtuse, carinate, 10 mm. long. Flowers subsessile. Sepals narrowly elliptic, obtuse, 18 mm. long, connate for 2.5 mm., carinate. Petals elliptic, obtuse, ca. 3 cm. long, connate for 7 mm. Capsule cylindric, 24 mm. long. Coma subferrugineous.

Endemic.

CHIRIQUÍ: Volcán de Chiriquí. Known only from cultivated material, collected by *Zahn* in 1870.

13. GUZMANIA GUATEMALENSIS L. B. Smith in Contrib. Gray Herb. 117:8. 1937.

Guzmania superba Suessenguth in Engler's Bot. Jahrb. 72:299, *pl. 4, Abb. 12.* 1942.

Probably stemless, 6 dm. high. Leaves over 6 dm. long; sheaths large, ovate, blades ligulate, acute, apiculate, 45 mm. wide. Scape erect, 7 mm. thick. Scape-bracts densely imbricate, foliaceous. Inflorescence laxly bipinnate, subpyramidal, 25 cm. long, glabrous. Primary bracts broadly ovate, acute, reaching only the second flower of the axillary branch. Racemes ascending or spreading, 10–12 cm. long, laxly 10- to 12-flowered, nearly straight. Floral bracts broadly elliptic, obtuse, 2 cm. long, inflated, ecarinate, subcoriaceous, stramineous when dry. Flowers spreading. Pedicels stout, 4 mm. long. Sepals elliptic, obtuse, 25 mm. long, ecarinate, connate for 10 mm. Petals 33 mm. long.

Fig. 141. *Guzmania guatemalensis*

Guatemala, Panama, Colombia.

COCLÉ: vicinity of La Mesa, north of El Valle de Antón, alt. 1000 m., *Allen 2368.* DARIÉN: rain forest, Cana-Cuasi Trail near crest, Chepigana District, alt. 1500 m., *Terry 1589.*

6. CATOPSIS Griseb.

CATOPSIS Griseb. Fl. Brit. W. Ind. 599. 1864.

Tussacia Willd. ex Beer, Bromel. 21, 99. 1857, non Reichenb. 1827.
Pogospermum Brongn. in Ann. Sci. Nat. V. 1:327. 1864.

Stemless herbs. Leaves densely utriculate-rosulate, entire, minutely appressed-lepidote, green, the sheath large. Scape conspicuous. Inflorescence usually bipinnate, rarely simple or tripinnate, exceeding the leaves, its branches polystichous-flowering. Flowers small or minute, usually sessile or nearly so, perfect or functionally dioecious. Sepals free, usually rounded and asymmetric, glabrous. Petals free, naked. Stamens included, unequal so far as known, anthers ovate or elliptic. Ovary superior, broadly ovoid or ellipsoid; style shorter than the ovary or wanting; ovules few to several, long-caudate. Capsule septicidal. Seeds with coma apical and folded over, their bases projecting from the capsule.

a. Sepals 10–15 mm. long.
  b. Petals bright yellow, much exceeding the submembranaceous sepals; scape slender, usually decurved ..... 1. C. NUTANS
  bb. Petals white, equaling or shorter than the coriaceous sepals; scape erect, stout ..... 2. C. BERTERONIANA
aa. Sepals not more than 9 mm. long.
  b. Scape-bracts shorter than the internodes.
    c. Sepals not more than 4.5 mm. long; inflorescence delicate with very slender axes; leaves usually 10–15 cm. long ..... 3. C. APICROIDES
  cc. Sepals 5–8 mm. long.

d. Leaves in a cylindric rosette, usually strict; sepals cuneate on the right with the wing much exceeding the midnerve, 5–6 mm. long ..... 4. C. NITIDA
dd. Leaves in a cyathiform rosette, arching-divergent; sepals curved on both sides of the base with the wing not exceeding the midnerve, 7–8 mm. long ..... 5. C. SESSILIFLORA
bb. Scape-bracts equaling or exceeding the internodes.
c. Leaf-blades ligulate, 2–4 cm. wide.
d. Sepals 2 mm. long, exceeding the floral bracts; scape erect ..... 6. C. MICRANTHA
dd. Sepals 5–7 mm. long, exceeded by the floral bracts; scape decurved ..... 7. C. WANGERINI
cc. Leaf-blades linear, not over 5 mm. wide; flowers barely more than 2-ranked ..... 8. C. LUNDELLIANA

1. CATOPSIS NUTANS (Sw.) Griseb. Fl. Brit. W. Ind. 599. 1864.

Tillandsia nutans Sw. Prodr. 56. 1788.
Tillandsia vitellina Lk., Kl. & Otto, Ic. Pl. Rar. 101. 1843.
Tussacia vitellina (Lk., Kl. & Otto) Kl. ex Beer, Bromel. 99. 1857.
Pogospermum flavum Brongn. in Ann. Sci. Nat. V. 1:328. 1864.
Pogospermum nutans (Sw.) Brongn. l. c. 1864.
Catopsis fulgens Griseb. in Nachr. Ges. Wiss. Gött. 1864:21. 1865.
Catopsis vitellina (Lk., Kl. & Otto) Baker in Jour. Bot. 25:176. 1887.

Plant 14–40 cm. high. Leaves about 10 in a subfasciculate rosette, to 24 cm. long, obscurely punctulate-lepidote, white-cretaceous especially toward base; sheaths elliptic, about half as long as the blades; blades subtriangular, acuminate, 25 mm. wide. Scape usually decurved, slender. Scape-bracts erect, lanceolate or elliptic, acuminate, typically much shorter than the internodes. Inflorescence simple or rarely few-branched. Primary bracts like the scape-bracts, shorter than the sterile naked base of the spike. Spikes laxly 3- to 15-flowered, to 2 dm. long. Rhachis nearly or quite straight, angled, glabrous. Floral bracts broadly ovate or elliptic, obtuse or broadly acute, the lower ones barely shorter than the sepals, the upper much shorter. Flowers perfect, erect to spreading. Sepals strongly asymmetric, broadly elliptic, obtuse, 15 mm. long, submembranaceous, nerved, glabrous. Petals ligulate with flaring blade, 2 cm. long, broadly acute or obtuse, bright yellow. Stamens unequal. Ovary ovoid, stout. Style very short but distinct. Capsule ovoid, long-beaked, 15–20 mm. long.

Fig. 142. *Catopsis nutans*

Greater Antilles, Vera Cruz to Panama, Venezuela and Ecuador.

CANAL ZONE: Las Cascadas Plantation, near Summit, *Standley 25763, 29671, 29697;* near Madden Dam and along Azote Caballo Road near Alahuela, alt. 90–100 m., *Dodge 16585.*

2. CATOPSIS BERTERONIANA (Schultes) Mez in DC. Monogr. Phan. 9:621. 1896.
Renealmia pendula Gaertn. Fruct. 3:13. 1805, non *Catopsis pendula* Bak. 1889.

Tillandsia pendula Thunb. ex Gaertn. l. c.
Tillandsia Berteroniana Schultes in R. & S. Syst. Veg. 7:1221. 1830.
Pogospermum Berteronianum (Schultes) Brongn. in Ann. Sci. Nat. V. 1:328. 1864.
Catopsis Mosenii Mez in DC. Monogr. Phan. 9:622. 1896.
Catopsis nutans sensu L. B. Smith in Ann. Missouri Bot. Gard. 24:180. 1937, non Griseb. 1864.

Fig. 143 *Catopsis Berteroniana*

Plant 4–9 dm. high. Leaves several in a subfasciculate rosette, to 4 dm. long, densely white-cretaceous especially toward base, light green; sheaths about as long as the blades, elliptic; blades triangular, acute, 4–5 cm. wide. Scape erect, 5–10 mm. thick, soon glabrous. Scape-bracts erect, the lower foliaceous and densely imbricate, the upper broadly ovate, apiculate, often shorter than the internodes. Inflorescence bipinnate or rarely simple, to 3 dm. long. Primary bracts mostly shorter than the sterile base of the spike, broadly ovate, apiculate. Spikes suberect, long-stipitate, rather laxly many-flowered. Floral bracts broadly ovate to suborbicular, obtuse, 6–8 mm. long, coriaceous. Flowers perfect, suberect. Sepals strongly asymmetric, obovate, to 12 mm. long and 9 mm. wide, equaling or exceeding the petals, coriaceous. Petals ovate-elliptic, white. Stamens unequal. Style distinct, one third as long as ovary. Capsule stoutly ellipsoid, barely exceeding the sepals.

Southern Florida, Greater Antilles, Guatemala, Panama, Trinidad, British Guiana, eastern Brazil.

COCLÉ: western slope and summit of Cerro Valle Chiquito, alt. 700–800 m., *Seibert 646;* vicinity of El Valle, alt. 100–800 m., *Allen 738.*

3. CATOPSIS APICROIDES (Schlecht. & Cham.) Baker in Jour. Bot. 25:174. 1887.

Tillandsia apicroides Schlecht. & Cham. in Linnaea 6:55. 1831.
Tussacia apicroides (Schlecht. & Cham.) Beer, Bromel. 263. 1857.
?*Catopsis Schindleri* Mez & Wercklé in Bull. Herb. Boiss. II. 4:1124. 1904, as to staminate plant.
?*Catopsis tenuis* Cufodontis in Archivio Bot. 9:181. 1933.

Fig. 144. *Catopsis apicroides*

Plant 12–45 cm. high with the inflorescence extended. Leaves few in a cyathiform rosette, usually 10–15 cm. long, obscurely punctulate-lepidote; sheaths elliptic, often as long as the blades but only slightly wider; blades ligulate, 10–25 mm. wide, the outer often acute, the inner always rounded and apiculate. Scape suberect or decurved, 1–1.5 mm. thick, glabrous. Scape-bracts remote, erect, involute, elliptic, apiculate. Inflorescence laxly bipinnate or rarely the lower branches divided, pyramidal. Axis flexuous to geniculate. Primary bracts like the scape-bracts, barely exceeding the short sterile naked base of the branch. Branches ascending, laxly many-flowered. Rhachis straight, very slender. Floral bracts ovate, 3–4 mm. long, equaling or shorter than the sepals. Flowers dioecious, spreading or subspreading. Sepals asymmetric, broadly elliptic, thin, to 4.5 mm. long. Petals elliptic, obtuse, 6 mm. long. Stamens very unequal in the male flowers. Ovary ovoid. Style short.

Southern Mexico to Panama.

BOCAS DEL TORO: Water Valley, *von Wedel 1374*; Old Bank Island, *von Wedel 2109*; Little Bocas, *von Wedel 2527*; Peach Creek, *von Wedel 2652*; Western River, *von Wedel 2781*. CANAL ZONE: vicinity of Fort Sherman, *Standley 31111*; drowned forest of Quebrada Ancha, *Steyermark & Allen*.

4. CATOPSIS NITIDA (Hook.) Griseb. Fl. Brit. W. Ind. 599. 1864.

Tillandsia nitida Hook. Exot. Fl. *pl. 218*. 1827.
Tussacia nitida (Hook.) Beer, Bromel. 100. 1857.
Pogospermum nitidum (Hook.) Brongn. in Ann. Sci. Nat. V. 1:328. 1864.

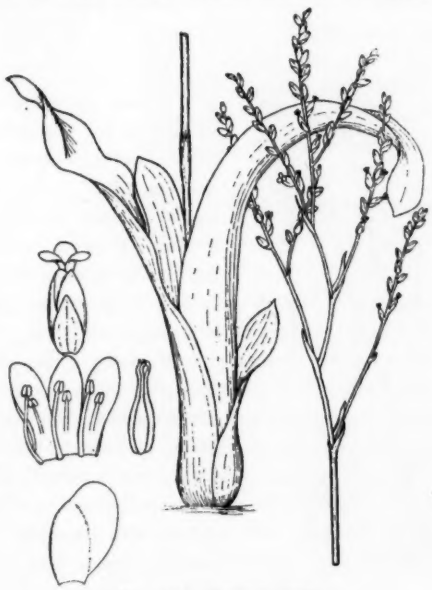

Fig. 145. *Catopsis nitida*

Up to 45 cm. high. Leaves few in an elongate cylindrical rosette, to 35 cm. long, narrowly scarious-margined, not cretaceous; sheaths very indistinct, about as long as the blades but scarcely wider; blades ligulate, rounded-apiculate, to 4 cm. wide. Scape erect or somewhat curved, slender. Scape-bracts remote, erect, involute, lance-ovate, obtuse and apiculate. Inflorescence laxly compound with simple or rarely divided branches, equaling or exceeding the leaves, 5–20 cm. long, glabrous. Primary bracts lanceolate, acute, much shorter than the usually naked sterile base of the spike. Spikes divergent, 3–12 cm. long, lax. Floral bracts broadly ovate, acute, shorter than the sepals. Flowers perfect. Sepals strongly asymmetric with the left side broadly elliptic and the right side cuneate at base and at the apex expanded into a large wing overtopping the midnerve, 5–6 mm. long, nerved, subcoriaceous. Petals elliptic, obtuse, barely exserted. Style lacking.

Greater Antilles, Guiana, Guatemala, Honduras, Costa Rica, Panama.

CHIRIQUÍ: forest, Bajo Mono, Boquete District, alt. 1350 m., *Davidson 535;* Boquete, alt. 1140 m., *Davidson 863.*

5. CATOPSIS SESSILIFLORA (R. & P.) Mez in DC. Monogr. Phan. 9:625. 1896.
Tillandsia sessiliflora R. & P. Fl. Peruv. 3:42. 1802.
Tussacia sessiliflora (R. & P.) Beer, Bromel. 101. 1857.
Pogospermum sessiliflorum (R. & P.) Brongn. in Ann. Sci. Nat. V. 1:328. 1864.
Catopsis nutans var. *erecta* Wittm. in Engler's Bot. Jahrb. 11:71. 1889.
Catopsis modesta Fritz Müller in Gartenfl. 42:717. 1893.

Fig. 146. *Catopsis sessiliflora*

Plant 1–3 dm. high. Leaves 4–13 in a tubular rosette, 8–20 cm. long, obscurely lepidote; sheaths inconspicuous, about as long as the blades but scarcely wider; blades curving outward, ligulate, rounded and apiculate, 12–25 mm. wide, flat, narrowly scarious-margined. Scape erect, slender, glabrous. Scape-bracts erect, much shorter than the internodes, broadly elliptic, apiculate. Inflorescence simple or compound from a few spikes, lax, to 11 cm. long, glabrous. Primary bracts like the scape-bracts, 7–8 mm. long, much shorter than the naked sterile base of the spikes. Spikes divergent, 2–9 cm. long, laxly flowered. Floral bracts broadly ovate, obtuse, much exceeded by the sepals, thin, nerved. Flowers suberect, perfect. Sepals asymmetric, suborbicular, 7–8 mm. long, subchartaceous, nerved,

wrinkled when dry. Petals lance-ovate, barely exserted, white. Stamens unequal. Ovary ovoid. Style very short. Capsule ovoid, distinctly short-beaked, 12 mm. long.

West Indies and southern Mexico to southern Brazil, Colombia and Peru.

BOCAS DEL TORO: Water Valley, *von Wedel 643;* Peach Creek, vicinity of Chiriquí Lagoon, *von Wedel 2653;* Western River, vicinity of Chiriquí Lagoon, *von Wedel 2788.* CANAL ZONE: vicinity of Fort Sherman, *Standley 31110;* Barro Colorado Island, *Standley 40855, Shattuck 604, Woodworth & Vestal 594, Aviles 18b;* westerly arm of Quebrada Salamanca, alt. 70 m., *Dodge, Steyermark & Allen 17031;* drowned forest of Quebrada Ancha, alt. 70 m., *Steyermark & Allen.* INDEFINITE: *Cowell 413.*

6. CATOPSIS MICRANTHA L. B. Smith in Ann. Missouri Bot. Gard. 30:83. 1943.

Fig. 147. *Catopsis micrantha*

Only the staminate plant known, nearly 1 m. high. Leaves many, erect, to 23 cm. long, more or less cretaceous toward base, the margins not contrasting with the rest of the leaf; sheaths longer than the blades but scarcely distinct; blades broadly ligulate, 4 cm. wide, broadly acute, apiculate, sparsely punctulate-lepidote above and densely beneath. Scape erect, slender. Scape-bracts subfoliaceous, densely imbricate. Inflorescence lax, amply tripinnate. Primary bracts suboblong, broadly acute, much shorter than the branches. Branches divergent, 2 dm. long. Spikes elongate, lax, many-flowered. Floral bracts broadly ovate, shorter than the sepals. Staminate flowers sessile, spreading. Sepals asymmetric, broadly obovate, 2 mm. long. Petals 3.5 mm. long, white. Stamens unequal.

Endemic.

BOCAS DEL TORO: hills behind Fish Creek, vicinity of Chiriquí Lagoon, *von Wedel 2236.*

7. CATOPSIS WANGERINII Mez & Werckle in Bull. Herb. Boiss. II. 4:1126. 1904. *Catopsis pusilla* Mez & Werckle in Fedde Rep. Spec. Nov. 14:248. 1916.

Staminate plants 3–4 dm. high. Leaves several in a cyathiform rosette, not over 18 cm. long; sheaths conspicuous, elliptic-ovate, brown-punctulate-lepidote; blades ligulate, acuminate, 22 mm. wide, glabrous. Scape decurved, very slender, equaling or exceeding the leaves. Scape-bracts lanceolate, acuminate, equaling or exceeding the internodes. Inflorescence compound with simple or compound branches, 15 cm. long, glabrous. Primary bracts like the scape-bracts, slightly exceeding the sterile bases of the axillary branches. Spikes 5 cm. long, dense, or subdense. Floral bracts elliptic, acute, cucullate above the sepals, thin, nerved. Flowers suberect. Sepals asymmetric with the right side produced into a large wing, 5–7 mm. long, chartaceous. Petals narrow, only exserted 2 mm. Stamens unequal.

Pistillate plants 10–25 cm. high. Scape erect or slightly curved, slender, shorter than the leaves. Scape-bracts broadly elliptic, acute, equaling or exceeding the internodes. Inflorescence simple, dense, 3–7 cm. long and 15 mm. thick. Sepals 7 mm. long.

Costa Rica, Panama.

CHIRIQUÍ: Finca Lérida to Peña Blanca, alt. 1750–2000 m., *Woodson & Schery 319.*

8. CATOPSIS LUNDELLIANA L. B. Smith in Contrib. Gray Herb. 117:6. 1937.

Fig. 148
Catopsis Lundelliana

Plant 25–30 cm. high. Leaves many in a dense subglobose rosette, 1 dm. long, densely and obscurely punctulate-lepidote; sheaths narrowly ovate or elliptic, 15–30 mm. long, not inflated; blades linear, acuminate, 5 mm. wide, involute toward apex. Scape erect, very slender, glabrous. Scape-bracts exceeding the internodes, lanceolate with a long narrow acuminate blade. Inflorescence lax, of 3–4 branches, 7–12 cm. long. Primary bracts like the upper scape-bracts, shorter than the sterile bases of the branches. Spikes divergent, straight, very laxly subtristichous-flowered, to 95 mm. long. Floral bracts broadly ovate, obtuse, thin, prominently nerved, much shorter than the sepals, obscurely lepidote. Flowers suberect. Sepals obovate, obtuse, strongly asymmetric, 5 mm. long, thin, obscurely lepidote. Petals barely exserted, broadly elliptic, obtuse. Stamens unequal. Style short but distinct.

British Honduras, Panama.

CANAL ZONE: Río Medio, *Miller 1754a.*

7. BROMELIA L.

BROMELIA L. Sp. Pl. 285. 1753.

[*Karatas* Plum. Gen. 10. 1703.]
[*Pinguin* Dill. Hort. Elth. 320. 1732.]
Karatas Mill. Gard. Dict. Abr. ed. 4. 1754.
Psedomelia Neck. Elem. 3:150. 1790.
Agallostachys Beer, Bromel. 16, 35. 1857.
Distiacanthus Baker, Handb. Bromel. 13. 1889.

Coarse terrestrial herbs, spreading by subterranean stolons. Leaves usually rosulate with large curved spines along the margin. Inflorescence sessile or stipitate, always compound. Sepals free or somewhat united, obtuse or acute, rarely mucronate. Petals rarely with a definite claw, dorsally united by the filaments but their margins free, not appendaged, fleshy in most species. Stamens included,

their filaments forming a long or short tube at base. Anthers narrow, acute. Ovary passing gradually into the thick pedicel, the epigynous tube conspicuous to nearly lacking. Berry succulent, relatively large. Seeds few to many, flattened.

a. Inflorescence elongate, lax, scapose ..... 1. B. PINGUIN
aa. Inflorescence a capitiform panicle sunk in the center of the leaf-rosette, covered with coarse elongate dark brown scales as are also the leaf-bases ..... 2. B. KARATAS

1. BROMELIA PINGUIN L. Sp. Pl. 285. 1753.

Bromelia ignea Beer, Bromel. 35. 1857.
Agallostachys Pinguin (L.) Beer, Bromel. 36. 1857.

Leaves many, rosulate, often over 2 m. long, not constricted between sheath and blade; sheaths very broad, coarsely tomentose-lepidote; blades linear, acuminate, 4 cm. wide, deep green above, pale green and very minutely pale-appressed-lepidote beneath, armed with stout teeth up to 10 mm. long. Scape stout, white-farinose. Scape-bracts foliaceous but with the sheaths roseate and subinflated. Inflorescence many-flowered, narrowly pyramidal, white-farinose. Primary bracts like the scape-bracts but the upper ones entire. Branches to 12-flowered. Floral bracts linear-subulate from a short broad base, 3 cm. long. Flowers to 6 cm. long, distinctly pedicellate. Sepals erect, very narrowly triangular-subulate, pale. Petals linear-elliptic, 3 cm. long, rose with white base and margins, densely white-tomentose at apex. Ovary slenderly ellipsoid, 2 cm. long. Berry ovoid, about 35 mm. long, yellow or ochraceous, strongly verrucose, acidulous, aromatic.

Fig. 149
Bromelia Pinguin

West Indies, Guiana, Mexico, Central America.

PANAMÁ: forests on dry limestone, around Alajuela, Chagres Valley, alt. 30–100 m., *Pittier 3482;* Chepo, alt. ca. 60 m., *Pittier 4703;* Bella Vista, at sea level, *Killip 12016.* CANAL ZONE: Balboa, *Standley 25498.*

According to Standley, this species in known as *Piñuela* in the Canal Zone and is frequent along the Pacific coast.

2. BROMELIA KARATAS L. Sp. Pl. 285. 1753.

Bromelia Acanga L. Syst. Nat. ed. 12. 2:232. 1767, in part.
Bromelia acaulis Stokes, Bot. Mat. Med. 2:204. 1812.
Nidularium Karatas (L.) Lem. ex Griseb. Fl. Brit. W. Ind. 591. 1864.
Karatas Plumieri E. Morr. in Belg. Hortic. 22:131. 1872.

Rosette up to 3 m. in diameter. Leaf-sheaths large, covered with long coarse dark brown scales; blades 3–5 cm. wide, acuminate, pungent, minutely lepidote beneath, laxly armed with coarse curved teeth 5–8 mm. long. Inflorescence many-flowered, flat-topped, surrounded by the red inner leaves. Primary bracts foliaceous. Floral bracts narrowly oblanceolate, attaining the middle of the sepals,

Fig. 150
Bromelia Karatas

entire or sparsely serrate, membranaceous, coarsely lepidote. Flowers 6–9 cm. long. Pedicels short, stout. Sepals lanceolate, acute, lepidote, 3 cm. long. Petals narrowly lanceolate, to 4 cm. long, connate for more than 2 cm., glabrous, rose with white base and margins. Ovary lepidote. Berry fusiform, 8 cm. long, 2 cm. thick, acid, edible.

Mexico and the West Indies to Colombia and Brazil.

PANAMÁ: Chepo, alt. ca. 60 m., *Pittier 4701*.

Planted for fences and known locally as *Piro*, according to Standley.

8. BILLBERGIA Thunb.

BILLBERGIA Thunb. Pl. Bras. Dec. 30. 1821.

Eucallias Raf. Fl. Tellur. 4:25. 1838.
Jonghea Lemaire in Jard. Fleur. 2: under *pl. 181–182*. 1852.
Cremobotrys Beer in Flora 37:348. 1854.
Helicodea Lemaire in Ill. Hortic. 11:*pl. 421*. 1864.

Plants stemless. Leaves usually few; sheaths large; blades spinose-serrate, often banded. Scape erect or decurved; scape-bracts red, thin. Inflorescence simple or compound. Flowers large, showy, usually sessile. Sepals free, erect. Petals free, nearly or quite regular, bearing 2 scales near base, claw long, blade narrow. Stamens exserted at anthesis. Pollen-grains with longitudinal folds but no pores. Epigynous tube large. Ovules many.

1. BILLBERGIA MACROLEPIS L. B. Smith in Contrib. Gray Herb. 114:3, *pl. 1, f. 6*. 1936.

Billbergia pallidiflora sensu Mez in DC. Monogr. Phan. 9:303. 1896, in part.

Plant 1 m. or more long when extended. Leaves to 12 dm. long; sheaths elliptic, large; blades linear-triangular, acuminate, 3 cm. wide, sparsely serrate with nearly straight teeth to 3 mm. long, entire toward apex, densely pale-lepidote, gray-green, marked below with large white spots. Scape decurved, 3–4 mm. thick, sparsely white-floccose at first. Scape-bracts imbricate, lanceolate, acuminate, to 24 cm. long, membranaceous, white-floccose. Inflorescence simple, cylindric, to 4 dm. long, lax, many-flowered, densely white-farinose. Floral bracts spreading or reflexed, narrowly oblong or the uppermost ovate, obtuse and apiculate, to 35 mm. long, all but the uppermost equaling or exceeding the ovary, membranaceous, dark brown when dry. Flowers sessile, suberect to spreading. Sepals symmetric, broadly

Fig. 151
Billbergia macrolepis

ovate, broadly acute and apiculate, equal, 10 mm. long, coriaceous, nerved. Petals linear, acute, to 43 mm. long, 4 mm. wide, bronze-green, spirally recurved at anthesis, bearing 2 coarsely crenate scales at base. Ovary subglobose, 15 mm. long, coarsely sulcate with the ridges soon glabrous, epigynous tube 3 mm. long.

Costa Rica, Panama.

PANAMÁ: Río Tecúmen, *Standley 29383;* Río Tapia, *Standley 30665.* CANAL ZONE: Barro Colorado Island, *Shattuck 373;* drowned forest along Río Chagres between junction with Río Pequení and with Río Indio, alt. 66 m., *Steyermark & Allen 16789.*

9. AECHMEA R. & P.

AECHMEA R. & P. Fl. Peruv. Prodr. 47. 1794. *Nomen conservandum.*

Hoiriri Adans. Fam. Pl. 2:67, 584. 1763.
Oechmea J. St.-Hil. Expos. Fam. 1:103. 1805.
Eriostax Raf. Fl. Tellur. 4:25. 1838.
Pothuava Gaud. Bot. Voy. Bonite, *pl. 116, 117.* 1847.
Macrochordion de Vriese in Jaarb. Nederl. Maatsch. Tuinb. 1853:14. 1853.
Hoplophytum Beer in Flora 37:348. 1854.
Echinostachys Brongn. ex Planch. Hort. Donat. 25. 1854.
Libonia Lemaire in Ill. Hortic. 2:*pl. 48.* 1855.
Lamprococcus Beer, Bromel. 21, 103. 1857.
Ortgiesia Regel in Gartenfl. 16:193. 1867.

Large or medium-sized stemless herbs. Leaves rosulate. Scape usually conspicuous. Inflorescence of various types. Flowers usually sessile. Sepals usually asymmetric, usually mucronate, free or connate. Petals free, bearing 2 scales each. Second series of stamens more or less joined to the petals. Pollen grains with 2 or 4 pores or sometimes aborted. Ovules caudate or obtuse. Berry usually dry. Seeds small.

a. Flowers slenderly pedicellate ..... 1. AE. MEXICANA
aa. Flowers sessile.
  b. Spikes polystichous-flowered.
    c. Floral bracts or at least the lower ones serrate or serrulate, nearly or quite as long as the flowers.
      d. Floral bracts firm, densely serrate or serrulate throughout.
        e. Spikes globose; inflorescence usually compound ..... 2. AE. MAGDALENAE
        ee. Spikes ovoid or conic to cylindric; inflorescence simple.
          f. Floral bracts sharply reflexed above the middle, equaling or longer than the mature flowers ..... 3. AE. VEITCHII
          ff. Floral bracts merely spreading above the middle, slightly shorter than the mature flowers ..... 4. AE. GERMINYANA
      dd. Floral bracts membranaceous, the lower ones denticulate toward apex and much exceeding the flowers ..... 5. AE. ALLENII
    cc. Floral bracts entire and much exceeded by the sepals or wanting.
      e. Floral bracts minute or wanting ..... 6. AE. NUDICAULIS
      ee. Floral bracts conspicuous, the lower ones broad ..... 7. AE. TONDUZII
  bb. Spikes distichous-flowered.
    c. Floral bracts alate-decurrent and forming a pouch about the flowers below ..... 8. AE. TILLANDSIOIDES
    cc. Floral bracts not at all decurrent.
      d. Floral bracts with overlapping edges, forming tubular sheaths about the bases of the flowers ..... 9. AE. SETIGERA
      dd. Floral bracts cymbiform or flat, their edges not meeting.

e. Floral bracts 5 mm. long; inflorescence bipinnate ..... 10. AE. ANGUSTIFOLIA
ee. Floral bracts 10–17 mm. long; inflorescence 2- to 3-pinnate.
f. Floral bracts imbricate and concealing the rhachis, 14–17 mm. long, faintly nerved near the margins ..... 11. AE. DACTYLINA
ff. Floral bracts spreading and exposing the rhachis, 10–13 mm. long, prominently and uniformly nerved ..... 12. AE. PUBESCENS

1. AECHMEA MEXICANA Baker in Jour. Bot. 17:165. 1879.

Aechmea Bernoulliana Wittm. in Engler's Bot. Jahrb. 14:Beibl. 32:1. 1891.

Plant 7 dm. to over 1 m. high. Leaves many in a utriculate rosette, 6–12 dm. long; sheaths indistinct, ovate, brown, densely lepidote; blades ligulate, acute to rounded and apiculate, 6–12 cm. wide, serrate with straight spines to 2 mm. long, finely pale-lepidote especially beneath. Scape erect, stout, pale-furfuraceous. Scape-bracts to 18 cm. long, much exceeding the internodes, linear-lanceolate, acuminate, entire, membranaceous, stramineous, pale-lepidote, the upper ones deflexed. Inflorescence amply paniculate, subcylindric to slenderly pyramidal, 3–7 dm. long, furfuraceous. Primary bracts linear to subfiliform, much shorter than the branches, membranaceous. Branches spreading, to 17 cm. long. Racemes laxly few-flowered. Floral bracts filiform, much shorter than the pedicels. Flowers divergent to spreading. Pedicels slender, 4–16 mm. long. Sepals broadly triangular-ovate, asymmetric, mucronate, 6 mm. long, free. Petals ligulate, emarginate, 10–15 mm. long, red or lilac, bearing 2 scales near base. Ovary globose or ellipsoid, 6 mm. long, often enlarging in fruit. Ovules borne at top of cell, caudate.

Fig. 152
Aechmea mexicana

Mexico (Vera Cruz), Guatemala, Costa Rica, Panama, Ecuador.

COCLÉ: north of El Valle de Antón, alt. ca. 1000 m., *Allen 2881, 2900.*

2. AECHMEA MAGDALENAE (André) André ex Baker, Handb. Bromel. 65. 1889.

Chevalliera Magdalenae André, Enum. Bromel. 3. 13 Dec. 1888; in Rev. Hortic. 60:563. 16 Dec. 1888.

Bromelia Magdalenae (André) C. H. Wright in Kew Bull. 1923:267 1923.

Ananas magdalenae (André) Standl. ex Standl. & Calderon, Lista Prelim. Pl. S. Salvador, 45. 1925.

Plant about 1 m. high. Leaves several in a laxly crateriform rosette, to 2 m. long; sheaths short and inconspicuous denticulate, covered with minute brown scales; blades linear, acuminate, 5–10 cm. wide, glabrous above, finely pale-lepidote beneath between the nerves, laxly armed with dark uncinate spines up to 5 mm. long; sheaths short and inconspicuous, denticulate, covered with minute brown much exceeding the internodes, the upper ones massed below the inflorescence and reflexed. Inflorescence simple or more often compound from a few subequal heads, compact, broadly pyramidal. Heads sessile, globose, 12 cm. thick. Floral bracts decurved from the middle, ovate with a triangular acuminate pungent apex, to 65 mm. long, coriaceous, thick, densely spinose-serrate, cinereous-lepidote be-

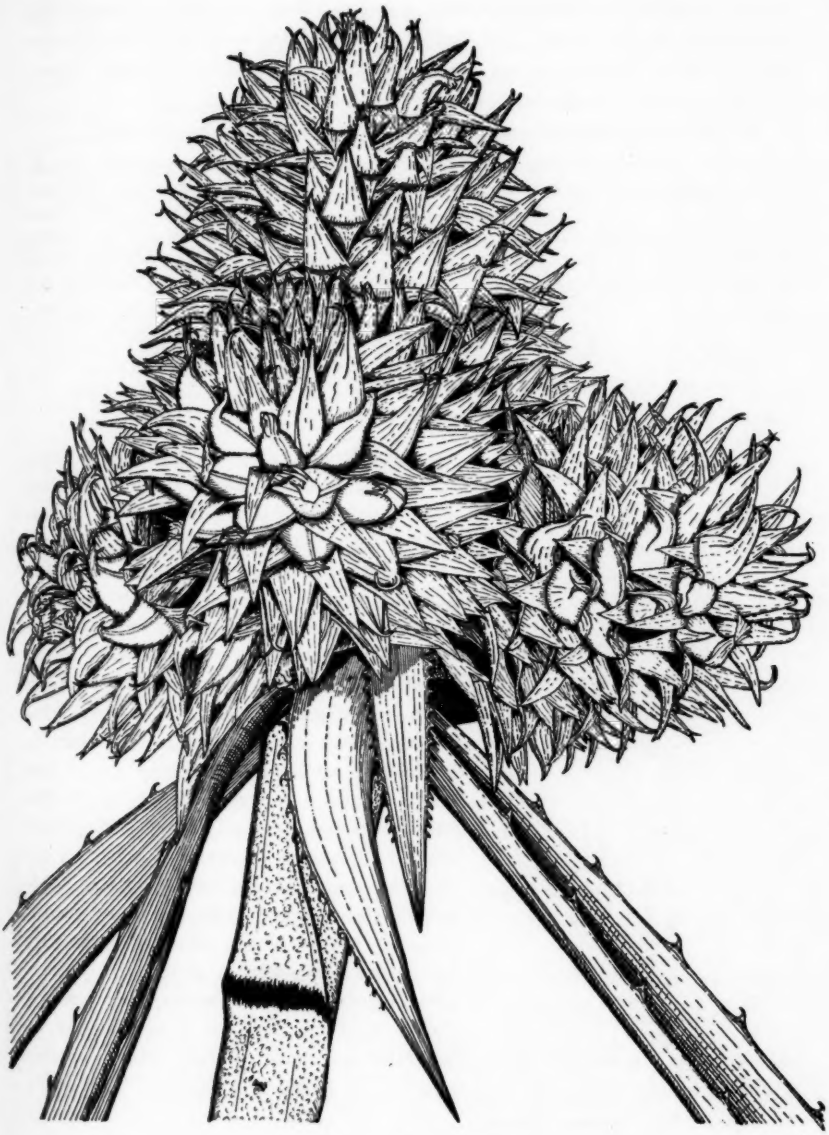

Fig. 153. *Aechmea magdalenae*

neath. Flowers sessile, to 5 cm. long, much compressed dorsally. Sepals asymmetric, narrowly triangular, acuminate, pungent, the anterior one to 38 mm. long, the posterior ones to 35 mm., free, lepidote. Petals 4 cm. long, acute, flavous when dry, bearing 2 minute truncate scales well above base. Ovary broadly elliptic, enlarged in fruit. Ovules borne in upper half of cell.

Mexico, Guatemala, Salvador, Costa Rica, Panama, Colombia, Ecuador.

BOCAS DEL TORO: *Carleton 278;* Water Valley, *von Wedel 711.* CHIRIQUÍ: vicinity of San Bartolomé, Peninsula de Burica, alt. 0–50 m., *Woodson & Schery 884.* PANAMÁ: wet forest, Río Tapia, *Standley 26142;* Río Tecúmen, *Standley 26753.* CANAL ZONE: along Caño Quebrado, *Pittier 6830;* hills north of Frijoles, *Standley 27613;* Gamboa, *Standley 28411;* near Fort Randolph, *Standley 28652;* Darién Station, *Standley 31633;* Barro Colorado Island, *Standley 31263, Salvoza 869, Aviles 17, Bailey 515, Shattuck 117, 420.*

Called *Pita* or *Piñuela.* The leaves yield a fiber of good quality.

3. AECHMEA VEITCHII Baker in Bot.Mag. 103: *pl. 6329.* 1877.

Chevalliera Veitchii (Bak.) E. Morr. in Belg. Hortic. 28:177, *pl. 9.* 1878.

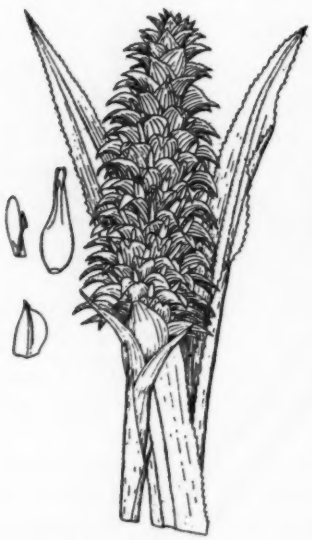

Fig. 154. *Aechmea Veitchii*

Stoloniferous, about 1 m. high. Leaves 12–17 in a loose cyathiform rosette, 3–10 dm. long; sheaths short and indistinct; blades ligulate, abruptly acute, apiculate, pungent, 4–6 cm. wide, glabrous and pale green above with spots of dark green, beneath densely cinereous-lepidote, spinulose with teeth 1 mm. long and 1–2 mm. apart. Scape erect, stout. Scape-bracts densely imbricate, foliaceous, acute or acuminate, spinulose-serrate. Inflorescence simple with flowers many-ranked, dense, cylindric or slenderly conic, 1–4 dm. long, 30–55 mm. thick. Floral bracts equaling or longer than the flowers but with the upper half sharply reflexed, lance-ovate, acuminate, pungent, 12–15 mm. long, densely spinose-serrate, bright red, glabrous above, sparsely white-furfuraceous beneath. Flowers sessile, suberect, 2 cm. long. Sepals free, asymmetric, acute, pungent, 13 mm. long, white with the extreme apex rose. Petals fugacious, ligulate, obtuse, barely exserted, bearing 2 oblique denticulate scales near base. Ovary stoutly obconic, glabrous, white. Ovules pendent from the top of the cell, caudate.

Costa Rica, Panama, Colombia.

DARIÉN: rain forest, north slope of Cana-Cuasi Trail, Real District, alt. 1650 m., *Terry 1545.*

4. AECHMEA GERMINYANA (Carr.) Baker, Handb. Brom. 66. 1889.

Chevalliera Germinyana Carr. in Rev. Hortic. 53:230. 1881.

Leaves 20–30 in a spreading rosette, often over 1 m. long, subchartaceous; sheaths ovate, distinct, large, densely appressed-lepidote; blades ligulate, subobtuse, ending in a broad brown mucro, closely serrulate with teeth 1 mm. long, appressed-lepidote beneath. Scape stout, erect. Scape-bracts imbricate, lance-elliptic, pungent, serrulate, green. Inflorescence simple, many-flowered, ovoid to cylindric with a small coma of sterile bracts at apex, to 9 cm. long and 65 mm. thick. Floral bracts densely imbricate with apices spreading at anthesis, ovate-elliptic, broadly acute, slightly shorter than the mature flowers, scarlet, appressed-lepidote at first, serrulate, subcoriaceous. Flowers sessile, 32 mm. long. Sepals free, asymmetric, subelliptic, 13 mm. long, mucronulate, glabrous. Petals about twice as long as sepals, acute, white, appendaged about one-fourth up from base. Ovary 6 mm. long, 3-angled, epigynous tube wanting. Berry globose, 7 mm. thick.

Panama, Colombia.

DARIÉN: vicinity of Cana, alt. 1800 m., *Williams 960*.

5. AECHMEA ALLENII L. B. Smith in Ann. Missouri Bot. Gard. 28:411, *pl. 19*. 1941.

Stemless, spreading by very stout stolons. Leaves subfasciculate, erect, 6–7 dm. long, much exceeding the inflorescence, densely and minutely appressed-lepidote; sheaths large, narrowly elliptic, entire, scarcely darker than the blades; blades ligulate, broadly acute and mucronate, not at all narrowed at base, to 55 mm. wide, densely serrulate, green. Scape slender, to 35 cm. long, white-flocculose. Scape-bracts densely imbricate, large, oblanceolate, acute, membranaceous, bright rose, denticulate toward apex, flocculose at base. Inflorescence erect, simple, densely ellipsoid, 8–10 cm. long, 4 cm. thick. Floral bracts erect, the lower ones like the scape-bracts and much exceeding the flowers, the upper narrowly lanceolate, acuminate, entire, equaling the sepals or slightly shorter. Flowers sessile. Sepals free, strongly asymmetric, 23 mm. long including the 6 mm. erect mucro, with the ovary densely white-lepidote. Petals 3 cm. long, bearing 2 dentate scales at base, white or pale lilac, ovary orbicular, strongly compressed and 3-angled, to 17 mm. long, epigynous tube crateriform, ovules borne near apex of cell, caudate.

Endemic.

COCLÉ: epiphytic; vicinity of La Mesa, north of El Valle de Antón, alt. 1000 m., *Allen 2378*; trail to Las Minas, north of El Valle de Antón, alt. 1000 m., *Allen 2467*.

6. AECHMEA NUDICAULIS (L.) Griseb. Fl. Brit. W. Ind. 593. 1864.

Bromelia nudicaulis L. Sp. Pl. 286. 1753.
Billbergia nudicaulis (L.) Lindl. in Bot. Reg. 13: under *pl. 1068*. 1827.
Billbergia pyramidata Beer, Bromel. 123. 1857.
Hoplophytum nudicaule (L.) K. Koch in Ind. Sem. Hort. Berol. 1856: App. 6. 1857.
Hohenbergia nudicaulis (L.) Baker in Saund. Refug. Bot. under *pl. 284*. 1871.
Pothuava nudicaulis (L.) Regel in Gartenfl. 31:291. 1882.

Fig. 155
Aechmea nudicaulis

Plant very variable in proportions, 3–7 dm. high. Leaves densely fasciculate, 3–10 dm. long; sheaths large, elliptic, forming an urceolate pseudobulb, purple or castaneous, densely brown-lepidote; blades ligulate, broadly obtuse and apiculate, not constricted at base, 6–10 cm. wide, coriaceous, densely pale-lepidote beneath, armed with coarse black teeth to 4 mm. long. Scape slender, erect or decurved, white-floccose. Scape-bracts imbricate, congested below the inflorescence, elliptic, acute, entire, red. Inflorescence a polystichous-flowered cylindric spike, fertile throughout, 5–25 cm. long, pale-floccose at first. Floral bracts small or sometimes wanting, entire. Flowers 22 mm. long. Sepals free, very asymmetric, mucronate, 5–10 mm. long. Petals acute, 12 mm. long, yellow, bearing 2 fimbriate scales. Ovary subglobose, the epigynous tube distinct. Ovules short-caudate, borne at the middle of the cell.

Mexico, Panama, and the West Indies, and a variety in Trinidad and Brazil.

BOCAS DEL TORO: Isla Colón, vicinity of Chiriquí Lagoon, *von Wedel 37, 115, 1166*; Water Valley, *von Wedel 737*.

Fig. 156
Aechmea Tonduzii

7. AECHMEA TONDUZII Mez & Pittier in Bull. Herb. Boiss. II. 3:132. 1903.

Leaves over 1 m. long; the inner sheaths erect, involute, elongate; blades ligulate, broadly obtuse, apiculate, laxly spinulose-serrate, becoming almost entire toward apex, 5 cm. wide, light green, coarsely pale-lepidote beneath. Scape erect, slender, less than a third as long as the leaves. Scape-bracts erect, slightly exceeding the internodes, lanceolate, acuminate into a weak mucro, entire or with a few minute teeth toward apex, membranaceous. Inflorescence a dense spike, cylindric, 7 cm. long, about 16-flowered. Floral bracts spreading to reflexed, triangular, acuminate, subpungent, much shorter than the fruiting ovary, entire, the lower ones broad. Sepals free, 3 mm. long including the terminal spine. Berry stout, ovoid, even, 18 mm. long.

Costa Rica, Panama.

DARIÉN: rain forest, Cana Cuasi Trail, near Camp 2, Chepigana District, alt. 1650 m., *Terry 1529*; near crest, alt. 1500 m., *Terry 1592*.

8. AECHMEA TILLANDSIOIDES (Mart.) Baker in Jour. Bot. 17:134. 1879.

Billbergia tillandsioides Mart. ex Schultes in R. & S. Syst. Veg. 7:1269. 1830.
Aechmea vriesioides Baker in Jour. Bot. 17:134. 1879.
Aechmea xiphophylla Baker, Handb. Bromel. 63. 1889.

Leaves fasciculate, very variable in proportions, 5–9 dm. long, minutely appressed-lepidote; sheaths elliptic, 2–15 cm. long, often castaneous toward base; blades linear, acuminate, not narrowed at base, 10–65 mm. wide, densely serrate with straight brown spines to 3 mm. long. Scape much shorter than the leaves, 1–5 mm. thick, sparsely white-flocculose at first. Scape-bracts remote, lanceolate, thin, densely and coarsely serrate, bright red. Inflorescence pinnately compound, fertile throughout, sparsely white-floccose when young. Primary bracts like the scape-bracts, suberect, longer or shorter than the spikes. Spikes suberect, sessile, oblong, 15 mm. wide, dense, distichously 6- to 12-flowered. Rhachis straight, square, stout, wing-angled with the wings adnate to the base of the floral bracts. Floral bracts imbricate at anthesis, then spreading, broadly elliptic, acute, mucronulate, 10–17 mm. long, equaling the sepals, ecarinate, entire, nerved, chartaceous. Sepals asymmetric, elliptic, mucronulate, 7–10 mm. long, subfree. Petals acute, mucronulate, 13–16 mm. long, dark purple with pale margin when dry, bearing 2 fimbriate scales. Ovary much enlarged in fruit. Ovules borne on the upper half of the column, caudate. Berry ellipsoid, 7–10 mm. long.

Represented in Panama only by the following:

AECHMEA TILLANDSIOIDES var. KIENASTII (E. Morr. ex Mez) L. B. Smith in Caldasia no. 5:5. 1942.

Aechmea chiriquensis Baker in Jour. Bot. 24:243. 1886.
Aechmea squarrosa Baker in Jour. Bot. 28:305. 1890, non Baker, 1889.
Aechmea Kienastii E. Morr. ex Mez in DC. Monogr. Phan. 9:243. 1896.

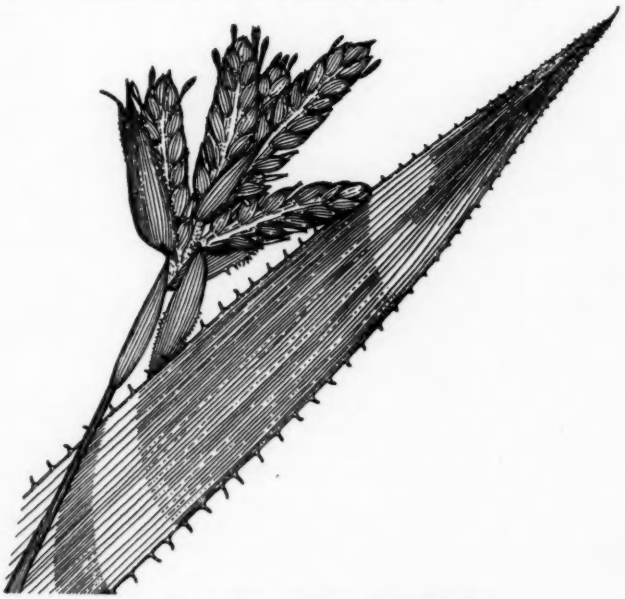

Fig. 157. *Aechmea tillandsioides* var. *Kienastii*

Inflorescence digitate or simple or if pinnate then with elongate spikes. Primary bracts spreading or reflexed. Spikes 6- to 30-flowered.

Southern Mexico, Central America, Colombia; the typical variety in Brazil, Guiana and Colombia.

BOCAS DEL TORO: vicinity of Laguna de Chiriquí, *Hart 173;* Water Valley, vicinity of Chiriquí Lagoon, *von Wedel 1837.* COLÓN: around Porto Bello, alt. 5–100 m., *Pittier 2431.* CANAL ZONE: railroad relocation between Gorgona and Gatún, alt. 10–50 m., *Pittier 2272;* Barro Colorado Island, *Shattuck 830;* westerly arm of Quebrada Salamanca, alt. 75 m., *Dodge, Steyermark & Allen 17030.*

9. AECHMEA SETIGERA Mart. ex Schultes in R. & S. Syst. Veg. 7:1273. 1830.

Aechmea Prieuriana Baker, Handb. Brom. 39. 1889.

Plant 1–3 m. high with the inflorescence extended. Leaves 1 m. long, coriaceous; sheaths suborbicular, 9 cm. long, entire, dark brown, covered below with a castaneous membrane, densely subfloccose-lepidote above; blades ligulate, scarcely or not constricted at base, acute or broadly rounded with a broad triangular apiculus, 35–70 mm. wide, glabrous above, densely lepidote beneath, densely spinose-serrate toward base with stout black teeth to 11 mm. long. Scape decurved, 13 mm. thick, sparsely tomentose-lepidote. Scape-bracts linear-lanceolate, acuminate, 2 dm. long, coarsely spinose-serrate, subchartaceous, bright red, pale-lepidote. Inflorescence densely bipinnate or the lowest fertile branches divided, cylindric, to 1 m. long and 9 cm. thick, sterile at base and apex and the apices of the remaining spikes or rarely the whole inflorescence. Primary bracts slenderly spiniform from a small triangular base, 3 cm. long, dark brown. Spikes laxly and distichously 2- to 4-flowered. Rhachis 25 mm. long, terete. Floral bracts subreniform, asymmetric, 1 cm. long, forming a tubular sheath about the base of the calyx, green, prominently nerved, bearing a slender dark brown terminal spine to 25 mm. long, those toward the apex of the spike sterile and gradually reduced to just the spine. Flowers sessile. Sepals very asymmetric, subelliptic, obtuse, 16 mm. long, entire, pale yellow-green, free. Petals obtuse, 3 cm. long, pale greenish yellow, bearing 2 fimbriate scales at base. Ovary much enlarged in fruit, the epigynous tube large. Ovules caudate, borne near top of cell.

Fig. 158. *Aechmea setigera*

Panama, Colombia, French Guiana, Amazonian Brazil.

PANAMÁ: Río Tapia, *Standley 30658.* CANAL ZONE: on dead tree in Gatún Lake near Erwin Island, *Shannon;* near Salamanca Hydrographic Station on the gorge of the Río Pequení, alt. 70–80 m., *Dodge, Steyermark & Allen 16976;* drowned forest in valley of Río Puente between the Tunnel and Natural Bridge, alt. 70 m., *Dodge & Allen 17323.*

10. AECHMEA ANGUSTIFOLIA Poepp. & Endl. Nov. Gen. & Sp. 2:43. 1837.

Hoplophytum angustifolium (Poepp. & Endl.) Beer, Bromel. 132. 1857.
Hohenbergia angustifolia (Poepp. & Endl.) Baker in Refug. Bot. 4:*pl. 284.* 1871.
Aechmea Cumingii Baker in Jour. Bot. 17:227. 1879.

Aechmea boliviana Rusby in Bull. N. Y. Bot. Gard. 4:456. 1907.
Aechmea cylindrica Mez in Fedde Rep. Spec. Nov. 12:413. 1913.
Aechmea inconspicua Harms in Notizbl. 10:786. 1929.

Fig. 159
Aechmea angustiflora

Plant to 75 cm. high. Leaves 10–15 in an ellipsoid rosette, 5–7 dm. long; sheaths elliptic, 1 dm. long, densely brown-lepidote; blades ligulate, 3–6 cm. wide, cinereous-lepidote, spinose-serrate. Scape erect, white-flocculose, later glabrous. Scape-bracts elliptic, acute, denticulate, red. Inflorescence dense or lax, bipinnate, cylindric, fertile throughout, 15–36 cm. long. Lowest primary bracts like the scape-bracts, exceeding the spikes, the others abruptly reduced to about the size of the floral bracts, ovate or narrowly triangular, acuminate. Spikes spreading or reflexed, distichously 10-flowered, 20–45 mm. long. Rhachis undulate, compressed. Floral bracts spreading, cymbiform, broadly ovate, mucronate, 5 mm. long, barely exceeding the ovary, puberulent. Flowers 12–16 mm. long. Sepals asymmetric, mucronate, free, 4–5 mm. long. Petals linear, mucronate, bearing 2 scales above base. Ovary ellipsoid. Ovules borne at summit of cell, caudate.

Costa Rica, Panama, Colombia, Peru, Bolivia, Brazil.

CANAL ZONE: between Maumé and Gorgona, *Wagner;* drowned forest of upper Río Pequení between Salamanca Hydrographic Station and Río Boquerón, alt. 70 m., *Allen in bb. Dodge 17272.* DARIÉN: vicinity of Cana, alt. 1800 m., *Williams 845;* Cana-Cuasi Trail, Chepigana District, alt. 1200 m., *Terry 1542.*

11. AECHMEA DACTYLINA Baker in Jour. Bot. 17:161. 1879.

Plant over 8 dm. high. Leaves 5–14 dm. long; sheaths very large, elliptic, pale-punctulate-lepidote; blades ligulate, acute, pungent, 45–75 mm. wide, rigid, pale green, serrate with spreading spines up to 1 cm. long. Scape erect, to 1 cm. thick, white-flocculose at first. Scape-bracts erect, imbricate, elliptic, acute or acuminate, entire, pale green or the upper ones red. Inflorescence amply paniculate, subthyrsoid, 25–60 cm. long. Axes angular, white-arachnoid. Primary bracts spreading or reflexed, narrowly lanceolate, acuminate, much shorter than the branches, bright red, sparsely lepidote or glabrous. Branches divergent to spreading, the lower ones usually divided and bearing 2–8 spikes, to 25 cm. long. Spikes linear, acute, 5–16 cm. long, 10–16 mm. wide, complanate, distichous-flowered. Floral bracts densely imbricate, broadly ovate to suborbicular, 14–17 mm. long, equaling or exceeding the sepals, mucronulate with free entire margins, sharply carinate toward apex, coriaceous, glabrous, finely nerved near margin. Flowers sessile, 17 mm. long. Sepals lanceolate, acute, alate, 7–8 mm. long, connate for 1 mm. Petals lingulate, acute, yellow. Stamens included. Ovary angled, gla-

Fig. 160
Aechmea dactylina

brous, the epigynous tube short. Ovules few, borne at top of cell, caudate.

Costa Rica, Panama, Colombia.

BOCAS DEL TORO: Western River, vicinity of Chiriquí Lagoon, *von Wedel 2787.* COLÓN: Chagres, *Fendler 450.* COCLÉ: Bismark, above Penonomé, alt. 600–900 m., *Williams 630.* CANAL ZONE: near Salamanca Hydrographic Station on the gorge of the Río Pequení, alt. 70–80 m., *Dodge, Steyermark & Allen 16976a;* westerly arm of Quebrada Salamanca, alt. 70 m., *Dodge, Steyermark & Allen 17039.*

12. AECHMEA PUBESCENS Baker in Jour. Bot. 17:135. 1879.

Plant 4–12 dm. high. Leaves few in a dense utriculate rosette, to 1 m. long, green and chartaceous except for a broad pale subcoriaceous channeled median portion, the outer leaves bladeless; sheaths broadly elliptic, 15 cm. long, densely brown-punctulate; blades narrowed from base nearly to middle but not truly petiolate, ligulate, acute, apiculate, 25–35 mm. wide, white-appressed-lepidote beneath, soon glabrous above, the basal half laxly serrate with straight or retrorse green teeth to 5 mm. long, the apical half subentire. Scape erect, slender, white-lanate, soon glabrous. Scape-bracts imbricate, lance-ovate, entire, membranaceous, bright red, pale-lepidote. Inflorescence bipinnate or the lower branches divided, oblong or pyramidal, 1–6 dm. long, fertile throughout, lax at least toward base, densely white-floccose at first. Primary bracts narrower than the scape-bracts, the lower ones equaling or exceeding the branches, the upper ones no larger than the floral bracts. Spikes linear, distichously 8- to 16-flowered, dense. Rhachis straight or slightly geniculate, flattened next the flowers. Floral bracts spreading, broadly ovate, acuminate, pungent, 10–13 mm. long, equaling or exceeding the sepals, entire with free margins, carinate toward apex, nerved. Flowers sessile. Sepals asymmetric, 6 mm. long, mucronulate. Petals obtuse, 10 mm. long, bearing 2 fimbriate scales high above the base. Ovary subellipsoid, 3-angled, slightly enlarged in fruit. Ovules attached near summit of cell.

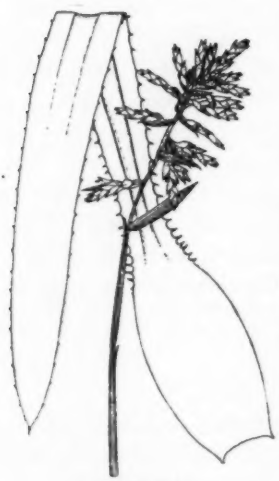

Fig. 161
Aechmea pubescens

Honduras, Nicaragua, Costa Rica, Panama, Colombia.

BOCAS DEL TORO: vicinity of Nievecita, alt. 0–50 m., *Woodson, Allen & Seibert 1855;* Isla Colón, *von Wedel 128;* indefinite, alt. ca. 30 m., *von Wedel 194;* Water Valley, *von Wedel 981;* hills behind Fish Creek, vicinity of Chiriquí Lagoon, *von Wedel 2395, 2442.* COLÓN: Chagres, *Fendler 449.* COCLÉ: region north of El Valle de Antón, alt. ca. 1000 m., *Allen 2905.* PANAMÁ: Río Tecúmen, *Standley 26671;* Río Pedro Miguel, near East Paraíso, *Standley 29992;* Juan Díaz, *Standley 30624;* Río Tapía, *Standley 30682, 30683;* between Matías Hernández and Juan Díaz, *Standley 31939;* Sabanas, *Bro. Paul 332.* CANAL ZONE: vicinity of Frijoles, *Piper 5775;* Las Cascadas Plantation, near Summit, *Standley 25715;* Barro Colorado Island, *Kenoyer 212, Bailey 200, Woodworth & Vestal*

630, *Shattuck 801*; drowned forest in valley of Río Puente between the Tunnel and Natural Bridge, alt. 70 m., *Dodge & Allen 17322*. DARIÉN: vicinity of Cana, alt. 600–1950 m., *Williams 965*. INDEFINITE: 1859-60, *Hayes 893*.

A specimen from Bergius in the Linnaean Society was probably collected by Pihl at Portobello, Colón Province.

10. ANANAS Mill.

ANANAS Mill. Gard. Dict. Abr. ed. 4. 1754.

Leaves densely rosulate, scarcely enlarged at base. Scape evident, erect. Inflorescence densely strobiliform, crowned with a tuft of sterile foliaceous bracts. Flowers sessile. Sepals free, obtuse, slightly asymmetric. Petals free, erect, violet or red, each bearing 2 slenderly infundibuliform scales. Stamens included; pollen-grains ellipsoid with 2 pores. Ovaries coalescing with each other and with the bracts and axis to form a fleshy compound fruit, the epigynous tube short. Ovules borne near top of cell.

1. ANANAS COMOSUS (L.) Merrill, Interpr. Rumph. Amb. 133. 1917.

Bromelia Ananas L. Sp. Pl. 285. 1753.
Bromelia comosa L. Herb. Amboin. 21. 1754.
Ananassa sativa Lindl. in Bot. Reg. 13: under *pl. 1068*. 1827, *nomen nudum*; Spach, Hist. Vég. 12:400. 1846.
Ananas sativus (Lindl.) Schultes in R. & S. Syst. Veg. 7:1283. 1830.
Ananas Ananas (L.) Voss in Vilm. Blumeng. ed. 3, 1:964. 1895.

Leaves coarsely and laxly spinose-serrate. Scape short, stout. Scape-bracts serrate. Inflorescence large, many-flowered. Floral bracts soon exposing the tops of the ovaries, relatively inconspicuous, weakly serrulate or entire. Syncarp well over 15 cm. long at maturity with copious palatable flesh. Seeds lacking or very rare.

Native of Brazil. Widely cultivated in the tropics and occasionally spontaneous.

Piña, Pine, Pineapple. Cultivated in the Canal Zone and on Taboga Island.

COMMELINACEAE

Succulent annual or perennial herbs. Leaves alternate, the petioles sheathing at the nodes. Inflorescence of simple or compound scorpioid cymes, rarely 1-flowered. Sepals 3, foliaceous, petalaceous, or scarious. Petals 3, equal or very unequal, the third occasionally very greatly reduced, mostly ephemeral and deliquescent. Stamens 1–6, occasionally sterile; filaments frequently bearded with moniliform hairs, equal or strongly unequal; anthers usually with a conspicuous sterile connective. Pistil 2- to 3-celled; capsule loculicidal, containing 3–12 seeds, ordinarily with a striking micropylar pit.

a. Ultimate branches of the inflorescence composed of individual scorpioid cymes appearing 1-sided superficially, solitary or variously clustered; corolla regular or irregular.
  b. Cymes variously clustered or compounded, rarely solitary, but not enclosed by a spathaceous bract.
    c. Fertile anthers separate; plants caulescent, terrestrial.
      d. Anthers large, with an inconspicuous connective, dehiscing by apical pores; seeds with a fleshy aril ..... 1. DICHORISANDRA
      dd. Anthers small, but with a conspicuous sterile connective, dehiscing longitudinally; seeds dry.
        e. Inflorescence of solitary cymes or umbellate clusters of cymes; ovary and capsules 3-celled.
          f. Flowers regular or essentially so, very small ..... 2. ANEILEMA
          ff. Flowers very strongly irregular, of moderate size ..... 3. TINANTIA
        ee. Inflorescence a dense panicle or thyrse; ovary and capsules 2-celled ..... 4. FLOSCOPA
    cc. Fertile anthers fused into a cochleate hood; large acaulescent epiphytes ..... 5. COCHLIOSTEMA
  bb. Cymes solitary, enclosed by a conspicuous spathaceous bract.
    c. Fruits dehiscent, capsular; sterile stamens with cruciate anthers ..... 6. COMMELINA
    cc. Fruits indehiscent, pergamentaceous; sterile stamens with sagittate anthers ..... 7. PHAEOSPHAERION
aa. Ultimate branches of the inflorescence composed of paired sessile scorpioid cymes appearing as a 2-sided unit superficially, rarely reduced to a solitary flower; corolla regular.
  b. Cymes subtended only by very inconspicuous scarious or slightly foliaceous bracts.
    c. Plants small or mediocre; stems creeping below, but erect or ascending above; bracts minute, scarious, not at all leaf-like; stamens 6, usually in 2 dissimilar series ..... 8. TRIPOGANDRA
    cc. Small prostrate plants; bracts inconspicuous but slightly foliaceous and obviously similar to the reduced upper stem leaves; stamens 1–6, all essentially similar ..... 9. CALLISIA
  bb. Cymes immediately subtended by 2–4 conspicuous foliaceous bracts.
    c. Stout erect herbs; sepals becoming fleshy in fruit ..... 10. CAMPELIA
    cc. Small creeping herbs; sepals withering in fruit.
      d. Both sepals and petals free ..... 11. TRADESCANTIA
      dd. Both sepals and petals fused into narrow tubes ..... 12. ZEBRINA

Rhoeo discolor (L'Hér.) Hance, a stout succulent herb with sword-shaped leaves purple beneath, is commonly planted in gardens. It is a native of Yucatan.

1. DICHORISANDRA Mikan

DICHORISANDRA Mikan, Del. Fl. & Faun. Bras. *pl. 3.* 1820. *Nomen conservandum.*
Stickmannia Neck. Elem. 3:171. 1791. *Nomen rejiciendum.*
Petaloxis Raf. Fl. Tellur. 2:83. 1836 [1837].

Large or moderate-sized perennial herbs; stem erect or ascending, occasionally weak and clambering. Inflorescence terminal, paniculate, the branches consisting of few- or several-flowered simple scorpioid cymes. Sepals 3, free. Petals 3, free, essentially equal. Stamens 6, rarely 5, all fertile; filaments short, free, naked; anthers ovoid-fusiform, with a narrow inconspicuous connective, dehiscing by apical pores. Ovary 3-celled. Capsule with 3–5 arillate seeds.

1. DICHORISANDRA HEXANDRA (Aubl.) Standl. in Standl. & Calderon, Lista Prelim. Pl. El Salvador, 48. 1925.

Commelina hexandra Aubl. Hist. Pl. Guian. Fr. 1:35. *pl. 12.* 1775.
Dichorisandra Aubletiana R. & S. Syst. 7:1181. 1829.

Fig. 162. *Dichorisandra hexandra*

Plants fairly stout, 1–3 m. tall; stems relatively slender, frequently weak and clambering, glabrous or minutely and irregularly puberulent. Leaves elliptic to obovate-elliptic, acuminate, obtuse at the base, 10–20 cm. long, subsessile, glabrous or indefinitely puberulent beneath; sheaths 1–3 cm. long, glabrous or pubescent, particularly at the orifice. Panicles 3–15 cm. long, bearing rather few to many fairly showy blue, rarely white, flowers 2–3 cm. in diameter; petals tardily deliquescent.

Guatemala to Brazil and Paraguay; in Panama a very frequent herb in lowland forests, ascending to the foothills.

BOCAS DEL TORO: Isla Colón, *von Wedel 2964;* Western River, *von Wedel 2784;* Fish Creek, *von Wedel 2409;* Water Valley, *von Wedel 1542;* Almirante, *Cooper 224.* CANAL ZONE: Río Pequení, *Woodson, Allen & Seibert 1593;* Cerro Gordo, *Pittier 3740;* Barro Colorado Island, *Standley 41139.* COCLÉ: between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1235;* El Valle de Antón, *Allen 1978, 1813;* Cerro Valle Chiquito, *Seibert 511.* DARIÉN: Río Yape, *Allen 367.* CHIRIQUÍ: San Bartolomé, *Woodson & Schery 883;* Puerto Armuelles, *Woodson & Schery 824.* PANAMÁ: Arraiján, *Woodson, Allen & Seibert 1395.*

This species is quite variable. In Brazil numerous species of *Dichorisandra* have been described, mostly of dubious validity.

2. ANEILEMA R. Br.

ANEILEMA R. Br. Prodr. 270. 1810; Woodson, Ann. Missouri Bot. Gard. 29:146. 1942.

Murdannia Royle, Illustr. Bot. Himal. 403, *pl. 95.* 1839 [1840].
Tradescantia of many authors, not L.

Small or fairly large, succulent perennials, perhaps annual in some species;

stems erect or decumbent-ascending. Leaves grass-like to fairly large and broad, sheathing at the base. Inflorescence terminal, usually lateral as well, simple or compound, the ultimate branches composed of individual scorpioid cymes subtended by inconspicuous bracts. Flowers small (in our species), regularly 3-merous. Fertile stamens 6, essentially similar, the anthers longitudinally dehiscent, with conspicuous sterile connectives. Ovary 3-celled. Fruit capsular; seeds dry.

Fig. 163
Aneilema geniculatum

1. ANEILEMA GENICULATUM (Jacq.) Woodson, Ann. Missouri Bot. Gard. 29:147. 1942.

Tradescantia geniculata Jacq. Select. Stirp. Am. Bot. 94. *pl. 64.* 1763.

Mediocre succulent herbs; stems usually creeping below, but erect or ascending above. Leaves ovate or ovate-lanceolate, acuminate, obtuse or rounded at the base, 3–6 cm. long, rather loosely hairy upon both surfaces, sessile or subsessile, the sheaths 0.5–1.0 cm. long, villous. Inflorescence loosely dichotomous, bearing few to many small white flowers. Sepals lance-trigonal, about 0.2 cm. long. Petals white, slightly exceeding the sepals.

Mexico to Brazil and Bolivia; Hispaniola, Puerto Rico, Trinidad, and the Lesser Antilles. Frequent in lowland forests.

BOCAS DEL TORO: Isla Colón, *von Wedel 1285*; Water Valley, *von Wedel 1681*; Western River, *von Wedel 1750*. CANAL ZONE: Barro Colorado Island, *Standley 41038*; Las Cascadas, *Standley 29681*; Culebra, *Pittier 2222*. COCLÉ: Penonomé, *Williams 632*. DARIÉN: Pinogana, *Allen 923*.

This species is cultivated in the tropics, as well as in greenhouses in temperate countries, making a pretty subject for hanging baskets.

3. TINANTIA Scheidw.

TINANTIA Scheidw. in Otto & Dietr. Allgem. Gartenzeit. 7:364. 1839. *Nomen conservandum*

Pogomesia Raf. Fl. Tellur. 3:67. 1836 [1837].

Mediocre or fairly large, succulent annuals; stems erect or ascending. Leaves rather large, sheathing at the base. Inflorescence terminal, few- or many-flowered, simple or umbellately compounded at the top of a leafless peduncle. Flowers moderately large, pink, violet, or white; sepals 3, conspicuous and somewhat foliaceous; petals 3, very unequal in size and usually in coloring; stamens 6, all fertile,

but the filaments of the 3 upper bearded and those of the lower naked; pistil 3-celled.

a. Calyx glabrous ..... 1. T. LEIOCALYX
aa. Calyx very densely glandular-pubescent ..... 2. T. ERECTA

1. TINANTIA LEIOCALYX C. B. Clarke, Bot. Gaz. 18:211. 1893.

Pogomesia leiocalyx (C. B. Clarke) Standl. Fl. Pan. Canal Zone (U. S. Nat. Herb. Contr. 27:) 111. 1928.

Plants 5–25 dm. tall, the stem erect or ascending, usually rooting at the lowermost nodes, pubescent. Leaves ovate to broadly elliptic, acuminate, obtuse or rounded at the base and produced into a narrow winged petiole, 10–20 cm. long, essentially glabrous; sheath 1–3 cm. long, sparingly pubescent. Inflorescence a few- to many-flowered scorpioid cyme, solitary or paired at the tip of a fairly elongate leafless peduncle. Sepals foliaceous, glabrous, about 1 cm. long. Petals somewhat surpassing the sepals, very unequal, the 2 posterior pinkish-mauve, the anterior nearly white; 3 uppermost stamens with copious deep yellowish beards, brownish at base, 3 lowermost naked.

Mexico to Panama, in lowland forest and bush.

BOCAS DEL TORO: Water Valley, *von Wedel 1481*. CANAL ZONE: Río Paraiso, *Standley 29864*. COCLÉ: between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1286*. PANAMÁ: Isla Taboga, *Woodson, Allen & Seibert 1504*.

2. TINANTIA ERECTA (Jacq.) Schlecht. Linnaea 25:185. 1852.

Tradescantia erecta Jacq. Collect. Bot. 4:113. 1790.
Tradescantia latifolia R. & P. Fl. Peruv. 3:44. *pl. 272*. 1802.
Tinantia fugax Scheidw. in Otto & Dietr. Allgem. Gartenzeit. 7:365. 1839.
Pogomesia erecta (Jacq.) Standl. Jour. Wash. Acad. Sci. 17:161. 1927.

Mediocre or fairly large succulent annuals; stem erect or ascending, usually rooting at the lowermost nodes, rather inconspicuously pubescent to glabrous. Leaves ovate- to obovate-elliptic, acuminate or obtuse at the tip, gradually narrowed to a broad subpetiolar base, 8–20 cm. long, scatteringly pubescent, particularly beneath; sheath 1.0–1.5 cm. long, scatteringly puberulent. Inflorescence densely glandular-puberulent, bearing few to many rather showy pale pink flowers in scorpioid cymes, either simple or several umbellately compounded at the tip of a more or less elongate, leafless peduncle.

Mexico to Venezuela; Jamaica and Hispaniola; also introduced in tropical Asia. Rather infrequent in highland forests.

CHIRIQUÍ: Volcán de Chiriquí, *Woodson & Schery 476; Woodson & Schery 250*; Upper Río Chiriquí Viejo valley, *P. White 63*.

4. FLOSCOPA Lour.

FLOSCOPA Lour. Fl. Cochinch. 192. 1790.
Dithyrocarpus Kunth, Enum. 4:77. 1843.

Mediocre succulent annuals with erect or ascending stems frequently rooting at the lower nodes. Leaves alternate, with basal sheaths. Inflorescence terminal,

diffusely paniculate, bearing very many small deliquescent flowers. Sepals 3, somewhat unequal. Petals 3, very unequal, the anterior much reduced. Stamens 6, rarely 5, in 2 dissimilar series; filaments naked. Pistil 2-celled.

1. Floscopa robusta (Seub.) C. B. Clarke in DC. Monogr. 3:271. 1891.
Dithyrocarpus robustus Seub. in Mart. Fl. Bras. 3[1]:255. 1855.
Floscopa Clarkeana O. Ktze. Rev. Gen. 2:720. 1891.

Mediocre annuals 1–2 dm. tall, more or less densely puberulent to glabrate throughout. Leaves elliptic- or oblong-oblanceolate, acuminate, gradually narrowed to a subpetiolar base, 10–30 cm. long; sheaths 1.0–1.5 cm. long, villous. Inflorescence diffusely and densely paniculate, bearing very many small, purple or white flowers, very densely glandular-puberulent throughout. Capsules pergamentaceous, very abundantly produced.

Nicaragua to northern Brazil and Peru; in lowland forest and bush.

Bocas del Toro: Sibubi, *Carleton 230;* Water Valley, *von Wedel 1724;* Fish Creek, *von Wedel 2328.*

5. COCHLIOSTEMA Lem.

Cochliostema Lem. Illustr. Hortic. 6: Misc. 70. *pl. 217.* 1859.

Massive succulent acaulescent epiphytes. Leaves rosulate, sheathed at the base. Inflorescences ternate at the several nodes of a large-bracted scape, bearing numerous extremely handsome purple flowers. Sepals 3, somewhat unequal. Petals 3, the posterior equilateral, the 2 anterior falcate, all fringed with moniliform hairs similar to those of the staminal filaments. Fertile stamens 3, united into a cochleate hood enclosing the anthers; staminodia 2. Pistil 3-celled.

1. Cochliostema odoratissimum Lem. Illustr. Hortic. 6: Misc. 70. *pl. 217.* 1859; Woodson & Schery, Ann. Missouri Bot. Gard. 29:149. 1942.
Cochliostema odoratum C. Koch & Bouché, Wochenschr. Ver. Gartenb. 340. 1859.
Cochliostema Jacobianum K. Koch & Linden, Wochenschr. Ver. Gartenb. 322. 1867.

Giant acaulescent epiphytes. Leaves rosulate, oblanceolate, acuminate, attenuated at the base into a long subpetiolar base, 4–10 dm. long; the basal sheath about

Fig. 164. *Cochliostema odoratissimum*

1 dm. long, glabrous throughout. Flowering scape rather stout, 3–8 dm. long, erect or pendulous, bearing 3-nate scorpioid cymes at the nodes, each subtended by a showy petalaceous, lanceolate bract 2–6 cm. long. Sepals about 3 cm. long. Petals about equalling the sepals, purple, densely fringed.

Costa Rica (?), Panama, Ecuador, Bolivia; epiphytic in lowland forests in Panama.

BOCAS DEL TORO: Lobo Creek, Chiriquí Lagoon, *von Wedel 2627;* Fish Creek, *von Wedel 2296.*

This is without doubt the most distinctive genus of Commelinaceae in its gigantic size, peculiar habit, and complexity of floral structure.

6. COMMELINA L.

COMMELINA L. Sp. Pl. 60. 1753.
Ananthopus Raf. Fl. Ludovic. 20. 1817.
Commelyna Kunth, Enum. 4:35. 1843.
Sauvallea Wright in Sauv. Fl. Cuba, 156. 1873.
Commelinantia Tharp, Bull. Torrey Bot. Club 49:269. 1922.

Small or mediocre, caulescent, subsucculent annuals. Leaves alternate, sheathing at the base. Inflorescences chiefly terminal, simply scorpioid, few-flowered, more or less enclosed by a conduplicate spathaceous bract. Sepals 3, subequal. Petals 3, two posterior equal, the anterior more or less reduced, frequently greatly so. Stamens 6, the upper 3 sterile, with cruciate anthers, the lower 3 fertile. Pistil 2- to 3-celled. Capsules loculicidally dehiscent.

a. Flowering spathes rounded and open at the base; plants creeping, relatively small ..... 1. C. DIFFUSA
aa. Flowering spathes closed and truncate at the base; plants essentially erect, relatively large ..... 2. C. ELEGANS

1. COMMELINA DIFFUSA Burm. f. Fl. Ind. 18. *pl. 7, fig. 2.* 1768.
Commelina longicaulis Jacq. Collect. Bot. 3:234. 1789.
Commelina pacifica Vahl, Enum. Pl. 2:168. 1806.
Commelina caespitosa Roxb. Fl. Ind. 1:178. 1820.
Commelina ochreata Schauer, Nova Acta Acad. Leop.-Carol. Nat. Cur. 19: Suppl. 1. 447. 1843.

Weak, creeping, subsucculent annuals, glabrous throughout. Leaves ovate- or oblong-elliptic, obtuse or acute, sessile or subsessile, 1–3 cm. long; sheaths 0.5–1.0 cm. long. Inflorescence terminal, the spathe foliaceous, conduplicate, ovate-cordate, open and rounded at the base. Flowers few, pale blue; sepals 0.2–0.25 cm. long; 2 posterior petals narrowly clawed, 0.3–0.5 cm. long, the anterior rudimentary or obsolete.

Nearly cosmopolitan; very common in waste places in Panama, at widely varying altitudes.

BOCAS DEL TORO: Water Valley, *von Wedel 990;* Nievecita, *Woodson, Allen & Seibert 1846.* CANAL ZONE: between Gatún and Lion Hill, *Pittier 2560.* COCLÉ: Penonomé, *Williams 346.* CHIRIQUÍ: Río Chiriquí Viejo valley, *Seibert 238;* Boquete, *Davidson 670;* Puerto Armuelles, *Woodson & Schery 831.* DARIÉN: Río Yape, *Allen 363.*

2. COMMELINA ELEGANS HBK. Nov. Gen. & Sp. 1:259. 1816.

Commelina caripensis HBK. loc. cit. 260. 1816.
Commelina sulcata Willd. ex R. & S. Syst. 1:342. 1817.
Commelina bahiensis Willd. ex R. & S. loc. cit. 1817.
Commelina Martiana Seub. in Mart. Fl. Bras. 3[1]: *pl. 37, fig. 1.* 1855.
Commelina virginica of many authors, not L.

Plants mediocre or relatively stout, erect or ascending, the stem branching rather frequently, 1.5–6.0 dm. tall, glabrous or essentially so. Leaves elliptic- or oblong-lanceolate, acuminate, obtuse at the base, sessile or subsessile, 3–12 cm. long, glabrous to sparsely pilose upon either surface; sheath about 1–2 cm. long, densely puberulent to glabrate. Inflorescences terminal or subterminal, solitary or paired; spathes conduplicate, foliaceous, broadly ovate, truncate and closed at the base, 1.5–2.0 cm. long, scatteringly pilosulose to glabrate. Sepals 0.3–0.4 cm. long, hyaline. Petals blue, obovate spatulate, the 2 posterior about 1 cm. long, the anterior somewhat reduced.

Tropical and subtropical America from Florida and Texas to Argentina; frequent in waste ground.

CANAL ZONE: Madden Dam, *Seibert 547;* Ancón Hill, *Seibert 106;* Río Pequení, *Woodson, Allen & Seibert 1625;* Barro Colorado Island, *Starry 116;* Balboa Heights, *Killip 3063.* COCLÉ: between Aguadulce and Antón, *Woodson, Allen & Seibert 1218;* Penonomé, *Williams 594.* PANAMÁ: Isla Taboga, *Woodson, Allen & Seibert 1430;* between Capira and Potrero, *Dodge & Hunter s. n.;* Bella Vista, *Standley 25396;* Río Tataré, *Woodson & Schery 1003;* Savana de Alhajuela, *Pittier 3479.*

Known in some districts of Panama as *Codillo.*

7. PHAEOSPHAERION Hassk.

PHAEOSPHAERION Hassk. Flora 49:212. 1866; Woodson, Ann. Missouri Bot. Gard. 29:150. 1942.

Athyrocarpus Schlecht. Linnaea 26:454. 1855.

Subsucculent annuals. Leaves alternate, sheathing at the base. Inflorescence simply scorpioid, few-flowered, enclosed by a conduplicate, foliaceous, sheathing bract. Sepals 3, free, hyaline, essentially equal. Petals 3, the 2 posterior enlarged, the anterior reduced. Stamens 6, in two series, the upper 3 sterile, with sagittate anthers, the lower 3 fertile. Pistil 3-celled. Fruit indehiscent, pergamentaceous. Closely similar to *Commelina* except in the indehiscent fruit.

a. Spathes long-pedunculate, solitary, their margins free; fruit dark purple ..... 1. PH. LEIOCARPUM
aa. Spathes nearly sessile, clustered, their margins united below; fruit whitish ..... 2. PH. PERSICARIAEFOLIUM

1. PHAEOSPHAERION LEIOCARPUM (Benth.) Hassk. Flora 49:212. 1866.

Commelina ? leiocarpa Benth. Bot. Voy. Sulph. 176. 1844.
Commelina pallida Schlecht. Linnaea 26:454. 1855.
Athyrocarpus leiocarpus (Benth.) Benth. & Hook. ex Hemsl. Biol. Cent.-Am. Bot. 3:386. 1884.

Medium-sized diffuse herbs; stems repeatedly and subdichotomously branching,

relatively slender, minutely scabrous to glabrate. Leaves oblong-elliptic, acuminate, obtuse at the base, 4–12 cm. long, subglaucous, glabrous or somewhat pubescent beneath. Inflorescences both lateral and subterminal, pedunculate; peduncles slender, deflexed, 1.5–3.0 cm. long, minutely scabrid; spathes conduplicate, broadly ovate-cordate, rounded and open at the base, acuminate, 3–5 cm. long, foliaceous, glabrous. Posterior petals long-unguiculate, about 1 cm. long, the anterior ovate, sessile, about 0.5–0.7 cm. long. Capsules ovoid, 0.7–0.9 cm. long, lustrous, deep purple.

Mexico to Venezuela; lowland forests and waste ground.

CANAL ZONE: Corozal, *Standley 27343;* Margarita Swamp, *Maxon & Valentine 7064;* between Ft. Clayton and Corozal, *Standley 29018.*

2. PHAEOSPHAERION PERSICARIAEFOLIUM (DC.) C. B. Clarke in DC. Monogr. 3:137. 1881.

Commelina persicariaefolia DC. in Redouté, Lil. 8: *pl. 472.* 1816.
Commelina rufipes Seub. in Mart. Fl. Bras. 3[1]:265. 1855.
Phaeosphaerion persicariaefolium (DC.) C. B. Clarke γ. *rufipes* (Seub.) C. B. Clarke, loc. cit. 1881.
Athyrocarpus persicariaefolius (DC.) Hemsl. Biol. Cent.-Am. Bot. 3:386. 1884.
Athyrocarpus rufipes (Seub.) Standl. in Standl. & Calderon, Lista Prelim. Fl. El Salvador, 47. 1925.

Mediocre, erect or ascending herbs 3–6 dm. tall; stem relatively slender, branching infrequently, glabrous or scatteringly pubescent. Leaves elliptic-lanceolate, narrowly acuminate, inequilaterally rounded at the base, 6–12 cm. long, generally ferruginous-pilose to glabrate, subsessile; sheaths 1–2 cm. long, ferruginously pilose, particularly above. Inflorescences subterminal, paired or in clusters of 3's and 4's, sessile or subsessile; spathes broadly ovate, truncate and closed at the base, obtuse or shortly acuminate at the tip, 2–3 cm. long, ferruginous-pilose. Capsules broadly ovoid, about 0.5 cm. thick, pearly white.

Guatemala to Peru; Cuba, Hispaniola, Puerto Rico, Trinidad; lowland forests and bush, also waste ground.

BOCAS DEL TORO: Changuinola valley, *Dunlap 430.* CANAL ZONE: Chagres, *Fendler 454;* Ft. Randolph, *Standley 28649;* Frijoles, *Standley 27481;* Ancón Hill, *Standley 25175.* COCLÉ: Penonomé, *Williams 523.* PANAMÁ: Río Tecúmen, *Hunter & Allen 244.*

8. TRIPOGANDRA Raf.

TRIPOGANDRA Raf. Fl. Tellur. 2:16. 1836[1837]; emend. Woodson, Ann. Missouri Bot. Gard. 29:150. 1942.

Heminema Raf. loc. cit. 17. 1837.
Descantaria Schlecht. Linnaea 26:140. 1853, nom. subnud.
Disgrega Hassk. Flora 49:215. 1866.
Leptorhoeo C. B. Clarke in Hemsl. Diagn. Pl. Nov. 55. 1880.
Donnellia C. B. Clarke, Bot. Gaz. 33:261. 1902.
Cuthbertia Small, Fl. Southeast. U. S. 237. 1903.
Neodonnellia Rose, Proc. Biol. Soc. Wash. 19:96. 1906.
Tradescantia of many authors, not L.

Subsucculent herbs of small or moderate size; stems creeping below, but erect or ascending above. Leaves alternate, sheathed at the base. Inflorescence terminal or subterminal, solitary or clustered, long-pedunculate, consisting of 2 equal, greatly condensed scorpioid cymes bearing few or several rather small flowers, not subtended by paired leaf-like bracts. Sepals 3, essentially equal. Petals 3, essentially equal. Stamens 6, usually in 2 very dissimilar series, the outer occasionally sterile; in a few species all fertile and essentially similar. Pistil 3-celled.

a. Stamens essentially similar, all fertile; petals blue; plants small, 1.0–1.5 dm. tall ..... 1. T. FLORIBUNDA
aa. Stamens 2 in very dissimilar series; petals pink or white; plants mediocre, 3–8 dm. tall
b. Inflorescence umbelliform, with relatively long pedicels and relatively short peduncles; sepals usually scatteringly glandular-pilose ..... 2. T. CUMANENSIS
bb. Inflorescence capituliform, with relatively short pedicels and relatively long peduncles; sepals glabrous ..... 3. T. ELONGATA

1. TRIPOGANDRA FLORIBUNDA (Hook. & Arn.) Woodson, Ann. Missouri Bot. Gard. 29:152. 1942.

Aneilema floribundum Hook. & Arn. Bot. Beechey Voy. 311. 1840.
Tradescantia filiformis Mart. & Gal. Bull. Acad. Brux. 9²:376. 1842.
Leptorhoeo filiformis (Mart. & Gal.) C. B. Clarke in Hemsl. Diagn. Pl. Nov. 55. 1880.
Leptorhoeo floribunda (Hook. & Arn.) Baill. Hist. Pl. 13:218. 1894.

Fig. 165
Tripogandra floribunda

Small herbs 1.0–1.5 dm. tall; stems slender, branching below, glabrous or minutely pilosulose. Leaves oblong-lanceolate, 1.0–3.5 cm. long, acute to acuminate, glabrous or the margins minutely ciliolate; sheaths 0.3–0.5 cm. long, ciliolate. Inflorescences terminal, infrequently in the upper leaf axils, rather shortly pedunculate, bearing few to several small blue, pedicellate flowers; pedicels 0.4–0.6 cm. long, minutely pilosulose; sepals 0.1–0.15 cm. long; petals 0.2–0.25 cm. long; stamens essentially similar, the filaments naked.

Mexico to Brazil; in meadows, frequently forming dense turfs.

PANAMÁ: Isla Taboga, *Woodson, Allen & Seibert 1507*; Las Sabanas, *Paul 566*; Matías Hernández, *Pittier 6778*; Chepo, *Pittier 4512*. CANAL ZONE: Gatún, *Standley 27301*; Summit, *Standley 26915*; Balboa, *Standley 25465*.

2. TRIPOGANDRA CUMANENSIS (Kunth) Woodson, Ann. Missouri Bot. Gard. 29:152. 1942.

Tradescantia cumanensis Kunth, Enum. 4:96. 1843.
Descantaria cumanensis (Kunth) Schlecht. ex Brückn. Notizblatt 10:56. 1927.

Mediocre herbs 3–8 dm. tall; stem creeping below, erect or ascending above, branching infrequently, glabrous or essentially so. Leaves oblong-lanceolate, acuminate, obtuse at the base, 5–12 cm. long, the margins usually ciliolate, other-

wise glabrous; sheaths 1–2 cm. long, somewhat inflated, scatteringly pilose to glabrate. Inflorescences corymbosely clustered in the axils of the upper leaves; peduncles 1–3 cm. long, minutely eglandular-pilosulose. Flowers pink or white; pedicels 0.3–0.5 cm. long, minutely glandular-pilosulose; sepals about 0.2 cm. long, minutely glandular-pilosulose, rarely glabrate.

Mexico to Brazil; in wet meadows in open forests chiefly at higher elevations.

BOCAS DEL TORO: Water Valley, *von Wedel 1634;* Isla Bastimentos, *von Wedel 2896;* Old Bank Island, *von Wedel 2061;* Almirante, *Cooper 78;* Changuinola valley, *Dunlap 304.* CANAL ZONE: Río Boquerón, *Steyermark & Allen 17248;* Barro Colorado Island, *Kenoyer 222;* Ft. San Lorenzo, *Maxon & Valentine 7018;* Gatún, *Hayes 240;* Chagres, *Fendler 452.* COCLÉ: Penonomé, *Williams 426.* CHIRIQUÍ: Finca Lérida to Boquete, *Woodson, Allen & Seibert 1144.* DARIÉN: Boca de Cupe, *Allen 890.* PANAMÁ: Río Trinidad, *Seibert 638;* Matías Hernández, *Standley 28930.*

It is quite possible that this species is merely a variety of *T. multiflora* (Sw.) Woodson, as may also be the case with the following:

3. TRIPOGANDRA ELONGATA (G. F. W. Meyer) Woodson, Ann. Missouri Bot. Gard. 29:152. 1942.

Tradescantia elongata G. F. W. Meyer, Fl. Esseq. 146. 1818.
Descantaria elongata (G. F. W. Meyer) Brückn. Notizblatt 10:56. 1927.

Mediocre herbs 3–7 dm. tall; stems relatively slender, creeping below, erect or ascending above, branching infrequently, glabrous. Leaves oblong-lanceolate, acuminate, obtuse at the base, sessile or subsessile, 4–10 cm. long, the margin ciliolate, otherwise glabrous; sheaths 0.5–1.0 cm. long, scatteringly pilose. Inflorescences terminal and axillary at the upper leaf nodes, conspicuously pedunculate; peduncles 1–3 cm. long, slender, eglandular-pilosulose. Flowers pink or white; pedicels 0.1 cm. long or less, glabrous; sepals ovate, 0.15 cm. long, glabrous; petals 0.2–0.25 cm. long.

Guatemala to Paraguay and Brazil; in meadows and open woods, chiefly at lower altitudes.

BOCAS DEL TORO: Water Valley, *Wedel 1527.* CANAL ZONE: Miraflores Lake, *Hunter & Allen 774;* Barro Colorado Island, *Standley 41079;* Gatún, *Hayes 40.* PANAMÁ: Río Tataré, *Woodson & Schery 1001.*

Doubtfully distinct from *T. cumanensis.*

9. CALLISIA L.

CALLISIA L. in Loefl. It. Hisp. 305. 1758.
Hapalanthus Jacq. Select. Stirp. Am. Bot. 11. *pl. 11.* 1763.
Spironema Lindl. Bot. Reg. *pl. 47,* Miscel. 26. 1840.
Tradescantella Small, Fl. Southeast. U. S. 238. 1903.

Small prostrate succulent herbs (in Panama); stem branching repeatedly, rooting at the nodes. Leaves sheathing at the base. Inflorescences terminal, also occasionally in the upper nodes, umbelliform, few-flowered, subtended by 2 small foliaceous bracts similar to the upper reduced leaves. Sepals 3, equal, scarious or

very slightly foliaceous. Petals 3, essentially equal. Stamens 6 (in Panama), all fertile and essentially similar. Pistil 3-celled.

1. CALLISIA CORDIFOLIA (Sw.) Anders. & Woods. Contr. Arn. Arb. 9:117. 1935.

Tradescantia cordifolia Sw. Prodr. Veg. Ind. Occ. 57. 1783.
Leiandra cordifolia (Sw.) Raf. Fl. Tellur. 2:16. 1836[1837].
Callisia meiandra Sauvalle, Fl. Cub. 159. 1873.
Tradescantia Floridana S. Wats. Proc. Amer. Acad. 17:381. 1882.
Tradescantella Floridana (S. Wats.) Small, Fl. Southeast. U. S. 238. 1913.

Small creeping herbs; stems slender, rooting at the nodes, glabrous. Leaves ovate to ovate-lanceolate, acuminate, rounded at the base, sessile, 0.5–3.0 cm. long, greatly reduced toward the inflorescence, glabrous; sheaths 0.2–0.5 cm. long, glabrous. Inflorescence umbelliform, few-flowered, terminal, occasionally also lateral in the axils of the reduced upper leaves, subtended by 2 inconspicuous, slightly foliaceous bracts 0.1–0.3 cm. long; pedicels 0.2–0.3 cm. long, minutely puberulent. Flowers inconspicuous, white; sepals lanceolate, 0.15–0.2 cm. long, scarious or very slightly foliaceous; petals about 0.25 cm. long.

Peninsular Florida and southeastern Mexico to northern Colombia; Greater Antilles. In wet forests and fields at low elevations.

CANAL ZONE: Darién Station, *Standley 31545;* Las Cascadas, *Pittier 2593.* COCLÉ: Bismarck, *Williams 614.* PANAMÁ: Old Panamá, *Killip 3231;* Río Tecúmen, *Standley 26742.*

10. CAMPELIA L. C. Rich.

CAMPELIA L. C. Rich. Anal. Fruit. 46. 1808.

Zanonia Cram. Diss. Syst. 75. 1803, non L.
Sarcoperis Raf. Fl. Tellur. 2:16. 1836 [1837].
Gonatandra Schlecht. Linnaea 24:659. 1851.

Massive subsucculent herbs. Leaves alternate, sheathing at the base. Inflorescences terminal on very slender, frequently compound, lateral peduncles, umbelliform, several-flowered, subtended by 2–4 conspicuous foliaceous bracts. Sepals 3, becoming fleshy in fruit, free, essentially equal. Petals 3, essentially equal, free. Stamens 6, the filaments of the outer slightly shortened. Pistil 3-celled. Fruit capsular, enclosed by the fleshy sepals.

1. CAMPELIA ZANONIA (L.) HBK. Nov. Gen. & Sp. 1:264. 1816.

Commelina Zanonia L. Sp. Pl. 61. 1753.
Tradescantia Zanonia (L.) Sw. Fl. Ind. Occ. 1:604. 1797.
Zanonia bibracteata Cram. Diss. Syst. 75. 1803.
Commelina bibracteata (Cram.) Wied-Neuwied, Beitr. Bras. 15. 1823.
Tradescantia capitata Vell. Fl. Flum. 3: *pl. 151.* 1827.
Commelina Boucheana R. & S. Syst. 7:1180. 1829.
Commelina pseudo-Zanonia Kunth, Enum. 4:108. 1843.
Commelina mexicana Mart. ex Kunth, loc. cit. 109. 1843.
Commelina glabrata Kunth, loc. cit. 1843.
Tradescantia Gonatandra Schlecht. Linnaea 23:659. 1851.

Gonatandra tradescantioides Schlecht. loc. cit. 1851.
Commelina fastigiata Schlecht. Linnaea 23:188. 1852.
Commelina Hoffmanni Hassk. Ind. Commelin. 80. 1870.
Campelia Zanonia (L.) HBK. β. *glabrata* (Kunth) C. B. Clarke, in DC. Monogr. 3:315. 1881.

Massive herbs 1–2 m. tall; stems stout, branching rather frequently. Leaves oblong-elliptic to oblanceolate, very narrowly acuminate, gradually narrowed to a subpetiolar base, 10–25 cm. long, glabrous to scatteringly pilose particularly along the margin; sheaths 1–2 cm. long, pilose on the margins. Flowering peduncles lateral, 8–16 cm. long, very slender, simple or branched, usually bearing the sheaths of reduced leaves, glabrous or pilosulose; flowering bracts lanceolate, foliaceous, 2–5 cm. long; umbels bearing few to several rather mediocre white flowers. Sepals 0.5–0.6 cm. long, somewhat foliaceous, glabrous, becoming fleshy and enclosing the fruit at maturity. Petals white, about as long as the sepals.

Mexico to Brazil and Bolivia; Greater Antilles. In wet forests at various elevations.

BOCAS DEL TORO: lower Changuinola River, *Stork 51;* Water Valley, *von Wedel 1540;* Pumpkin River, *von Wedel 2564;* Peach Creek, *von Wedel 2647.* CANAL ZONE: Quebrada Culebra, *Dodge & Allen 17057;* Quebrada Salamanca, *Steyermark & Allen s. n.;* Quebrada Bonita, *Steyermark & Allen s. n.;* Gatún, *Standley 27202;* Barro Colorado Island, *Shattuck 124.* CHIRIQUÍ: El Boquete, *Pittier 2919;* Bajo Chorro, *Woodson & Schery 654;* Quebrada Velo, *Woodson & Schery 252.* COCLÉ: El Valle de Antón, *Woodson & Schery 176;* La Pintada, *Hunter & Allen 634.* DARIÉN: Cana, *Williams 804.* PANAMÁ: Río Tecúmen, *Standley 29361.*

Known popularly as *Conyotura, Caña de Cristo,* and *Cañutillo,* and reported as a remedy for venereal diseases. One of the commonest rank herbs of the forests at practically all altitudes.

11. TRADESCANTIA L.

TRADESCANTIA L. Sp. Pl. 411. 1753.

Ephemerum Tourn. ex Moench. Meth. 237. 1794.
Etheosanthes Raf. Neogenyt. 3. 1825.
Aplopleia Raf. Fl. Tellur. 2:16. 1836 [1837].
Gibasis Raf. loc. cit. 1837.
Phyodina Raf. loc. cit. 1837.
Tropitia Raf. loc. cit. 3:68. 1837.
Heterachthia Kunze, Bot. Zeit. 8:1. 1850.
Mandonia Hassk. Flora 54:260. 1850, non Wedd.
Skofitzia Hassk. & Kanitz. Oester. Bot. Zeitschr. 22:147. 1872.

Small, essentially prostrate subsucculent herbs (in Panama), the stem creeping and ascending at the tips, rooting at the nodes. Leaves alternate, sheathing at the base. Inflorescences subterminal, also lateral at the upper nodes, short- or long-pedunculate, bearing an umbelliform cluster of few to several flowers subtended by 2 conspicuous foliaceous bracts. Sepals 3, free and essentially equal. Petals 3, free and essentially equal. Stamens 6, all fertile and equal. Pistil 3-celled.

Fig. 166. *Tradescantia commelinoides*

1. TRADESCANTIA COMMELINOIDES R. & S. Syst. 7:1176. 1829.

Tradescantia commelinoides R. & S. a. *rotundifolia* C. B. Clarke, in DC. Monogr. 3:296. 1881.

Small creeping herbs, the stems ascending at the tips, rooting at the lower nodes, glabrous. Leaves ovate- to oblong-elliptic, acuminate, obtuse and subsessile at the base, 3–8 cm. long, glabrous or ciliate at the base; sheaths 0.5–1.0 cm. long, the margins pilose. Peduncles 1–3 cm. long, usually rather densely pilose; bracts more or less conduplicate, ovate, acute or acuminate, foliaceous, 1.0–2.5 cm. long. Flowers bright pink; pedicels 0.4–0.5 cm. long, minutely puberulent to glabrate; sepals elliptic, keeled, 0.2 cm. long, minutely puberulent; petals 0.5–0.6 cm. long.

Mexico to Panama. In moist highland forests.

CHIRIQUÍ: Río Chiriquí Viejo valley, *Seibert 230;* Volcán Chiriquí, *Woodson, Allen & Seibert 803;* Quebrada Velo, *Woodson & Schery 241;* Bajo Mona and Quebrada Chiquero, *Woodson & Schery 556.*

12. ZEBRINA Schnizl.

ZEBRINA Schnizl. Bot. Zeit. 7:870. 1849.

Small creeping, subsucculent herbs; stems slender, ascending at the tips, rooting at the nodes. Leaves alternate, sheathing at the base. Inflorescences terminal, umbelliform, subtended by 2–3 conspicuous foliaceous bracts. Sepals 3, united into a narrow tube, hyaline or scarious. Petals 3, united into a narrow tube, the limb 3-parted. Stamens 6, fertile, essentially equal. Pistil 3-celled.

1. ZEBRINA PENDULA Schnizl. Bot. Zeit. 7:870. 1849.

Cyanotis vittata Lindl. Jour. Roy. Hort. Soc. 5:139. 1850.
Cyanotis Zebrina Nees, Delect. Sem. Hort. Vratislav. 1850.

Small creeping herbs; stems branching frequently, rooting at the nodes, ascending at the flowering tips. Leaves elliptic, acuminate, obtuse and subsessile at the base, 2–6 cm. long, green mottled with silver above, purple beneath, scatteringly pilose on either surface; sheath 0.5–0.8 cm. long, laxly pilose. Flowering bracts similar to the foliage leaves, subtending an umbelliform cluster of few to

several rather pretty pink flowers. Calyx tube 0.2–0.3 cm. long. Corolla 0.5–0.9 cm. long.

Mexico and Central America, very frequently cultivated, and escaping in warmer climates, the world over. In moist forests at higher elevations.

BOCAS DEL TORO: Water Valley, *von Wedel 785;* Chiriquí Trail, *von Wedel 2177.*

This is the familiar "Wandering Jew" of greenhouses and hanging baskets. Popular names in Costa Rica are reported by Standley as *Hoja de milagro* and *Cañutillo.*

PONTEDERIACEAE

Perennial bog or aquatic herbs with stems and entire leaves. Aerial leaves long-petioled. Stems sometimes reduced. Inflorescence with basal spathe, axillary from the rootstalk or stem; flowers spicate, paniculate or solitary, usually conspicuous, salverform or funnelform, zygomorphic or nearly regular. Calyx and corolla petaloid, marcescent, more or less united. Stamens 3-6, unequally adnate to the perianth tube. Ovary superior; style slender; terminal stigma 3- to 6-lobed or toothed. Fruit an achene or capsule.

a. Stamens 3; perianth nearly regular; flowers solitary or in a few-flowered lax spike; leaf blade relatively small, usually about 1–3 cm. broad ..... 1. HETERANTHERA

aa. Stamens 6; perianth zygomorphic; flowers usually many, in large dense spikes; leaf blade relatively large, usually about 4–9 cm. broad.

b. Ovary with 3 fertile cells, ovules numerous in each cell; fruit a dehiscent capsule; flowers relatively large, about 3–6 cm. long; plants floating or more or less rooted and trailing-procumbent; leaves not cordate ..... 2. EICHHORNIA

bb. Ovary with 1 fertile cell, ovule solitary; fruit achenoid; flowers smaller, about 1–2 cm. long; plants rooted, erect, or if trailing-procumbent; leaves more or less cordate or sagittate ..... 3. PONTEDERIA

1. HETERANTHERA R. & P.

HETERANTHERA R. & P. Fl. Peruv. Prodr. 9. 1794; Fl. Peruv. 1:43. 1798.

Phrynium Löfl. Iter Hisp. 178. 1758, as syn.
Schollera Schreb. Gen. 785. 1791.
Heterandra Beauv. Trans. Amer. Phil. Soc. 4:175. 1799.
Leptanthus Michx. Fl. Bor. Am. 1:24. 1803.
Buchosia Vell. Fl. Flum. 33. 1825.
Lunania Raf. Med. Fl. 2:106. 1830.
Triexastema Raf. Fl. Tell. 4:121. 1838.

Plants submerged or floating or of swampy places. Aerial leaves petiolate, expanded; submerged leaves, if present, grass-like. Inflorescence loosely spicate or with a solitary flower. Peduncle exserted from or ensheathed by the spathe. Perianth nearly regular, salverform, white or blue, the outer lobes narrower than the inner. Stamens 3, unequal, one with a much longer filament and larger anther. Ovary many-ovulate. Fruit capsular; seeds very numerous.

a. Single flower (rarely 2) sub-ensheathed by the spathe; leaves usually dimorphic ..... 1. H. LIMOSA
aa. Flowers 2 or many; leaves monomorphic, not grass-like and submerged.
b. Leaf blade reniform; inflorescence short-spicate, more or less ensheathed by the spathe; no cleistogamous flowers ..... 2. H. RENIFORMIS
bb. Leaf blade cordate, apex projected; inflorescence long-spicate, not ensheathed by the spathe; lower flowers cleistogamous ..... 3. H. SPICATA

1. HETERANTHERA LIMOSA (Sw.) Willd. Ges. Nat. Freunde Berlin 3:439. 1801.

Pontederia limosa Sw. Prodr. 57. 1788.
Leptanthus ovalis Michx. Fl. Bor. Am. 1:25. 1803.
Heteranthera alismoides Link, Jahrb. Gewachsk. 1^3:73. 1820.
Lunania uniflora Raf. Med. Fl. 2:106. 1830.
Triexastema uniflora Raf. Fl. Tell. 4:121. 1838.
Schollera limosa (Sw.) O. Ktze. Rev. Gen. 2:719. 1891.
Phrynium limosum (Sw.) O. Ktze. loc. cit. 3^3:318. 1898.

Fig. 167. *Heteranthera limosa*

Rooted plant, sometimes with creeping stems. Leaves usually dimorphic, the submerged linear and grass-like, the aerial with more or less expanded blade lanceolate to oblong, often narrowly so, 1–5 cm. long, base short-cuneate, rounded or shallowly cordate; petiole elongate, stipulate. Spathe sub-ensheathing the inflorescence, caudate, 1.5–4.0 cm. long. Inflorescence of a single flower; flower 2–6 cm. long, tube 1–4 cm. long, blue or whitish; anthers lanceolate, bilobed, almost basifixed; filaments glabrous, adnate to the perianth tube; style elongate, slightly longer than the tube, and with an expanded, tufted stigma. Ovary 1-celled, many-ovulate; capsule oblong, narrow, 1–2 cm. long; seed about 0.4 x 0.8 mm., brown, about 10-ridged longitudinally, one ridge enlarged; seed-coat striated horizontally.

United States to Argentina.

COCLÉ: pools and their margins in wet llanos between Aguadulce and Antón, *Woodson, Allen & Seibert 1221*. HERRERA: Pesé, *Allen 809*. PANAMÁ: in pond, vicinity of Bejuco, *Woodson, Allen & Seibert 1687*; between Panamá and Chepo, *Dodge, Hunter, Steyermark & Allen 16720*.

2. HETERANTHERA RENIFORMIS R. & P. Fl. Peruv. 1:43. 1798.

Heterandra reniformis (R. & P.) Beauv. Trans. Amer. Phil. Soc. 4:175. 1799.
Heteranthera acuta Willd. Ges. Nat. Freunde Berlin 3:438. 1801.
Leptanthus reniformis (R. & P.) Michx. Fl. Bor. Am. 1:25. 1803.
Leptanthus virginicus Pers. Syn. Pl. 1:56. 1805.
Leptanthus peruvianus Pers. loc. cit. 1805.
Heteranthera acuta (Willd.) Vahl, Enum. Pl. 2:42. 1805.
Buchosia aquatica Vell. Fl. Flum. 33. 1825.
Heteranthera virginica (Pers.) Steud. Nomencl. Bot. ed. 2, 2:29. 1841, as syn.
Schollera reniformis (R. & P.) O. Ktze. Rev. Gen. 2:719. 1891.
Phrynium reniforme (R. & P.) O. Ktze. Rev. Gen. 3^3:318. 1898.

Plants rooted, with elongate creeping stems. Leaves monomorphic with expanded reniform blade as large as 3 cm. long and 5 cm. broad; petiole extended. Spathe loosely ensheathing, caudate, 1–3 cm. long. Inflorescence short-spicate, 1–5 cm. long, 2- to 6-flowered. Flowers white or lavender, less than 2 cm. long, the tube less than 1 cm. long, usually about 0.7 cm. long; perianth lobes spreading, glandular-pubescent without; anterior sepal reflexed, very narrow; posterior petal somewhat expanded, green at base; stamens dimorphic, anterior longer, about 4 mm. long, posterior ones shorter, about 2 mm. long; larger anther oblong, green, about 1.5 mm. long, smaller ones globular, yellow, basifixed, about 0.5 mm. long; filaments dilated at their base, adnate to the perianth tube; style longer than the tube, about 7 mm. long above the ovary, with an expanded brush-like stigma facing upward and inward. Capsule about 1 cm. long; seed columnar, longitudinally ridged, 0.5–0.8 mm. long, 0.3–0.5 mm. broad.

United States to Argentina.

CANAL ZONE: Summit, *Woodson & Schery 1022*. CHIRIQUÍ: swamps in pasture, Boquete, alt. 3800 ft., *Davidson 571*. COCLÉ: bogs, El Valle de Antón, alt. 500–700 m., *Seibert 446*; between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1752*; lower Río Antón, *Allen 105*. BOCAS DEL TORO: Water Valley, *von Wedel 1501*. PANAMÁ: pool in savanna between Panamá and Chepo, *Dodge, Hunter, Steyermark & Allen 16714*.

3. HETERANTHERA SPICATA Presl, Symb. Bot. 18. 1830.

Schollera spicata (Presl) O. Ktze. Rev. Gen. 2:719. 1891.

Plant rooted in the mud. Leaves erect, long-petioled; blade cordate, 1–6 cm. long and broad, apex acute or obtuse. Spathe 1–3 cm. long, caudate-tipped, ensheathing only the lowest flower. Inflorescence long-spicate, to 10 cm. long, about 10-flowered, the lower 1 to few flowers cleistogamous. Flowers white, about 1 cm. long, the tube 0.3–0.7 cm. long; stamens dimorphic and unequal, larger anther 3 mm. long, the smaller ones 2 mm. long, filaments dilated toward their base, adnate to the tube; style protruding beyond the tube, stigma capitate. Cleistogamous capsules larger than the upper ones, 0.6–1.0 cm. long; seeds ellipsoid, 0.3–0.4 mm. long, 0.2 mm. wide, longitudinally ridged.

Mexico, Panama, Dominican Republic, Cuba.

COCLÉ: Aguadulce, *Pittier 4979*. HERRERA: Pesé, *Allen 808*.

2. EICHHORNIA Kunth

EICHHORNIA Kunth, Enum. Pl. 4:129. 1843.

Piaropus Raf. Fl. Tell. 2:81. 1837. *Nomen rejiciendum.*
Leptosomus Schlecht. Abh. Nat. Ges. Halle 6:174. 1862.
Cabanisia Kl.; Schlecht. loc. cit. 176. 1862.

Perennial aquatic herbs. Leaves petiolate, blade expanded, petiole often inflated. Inflorescence spicate and with a basal spathe. Perianth showy, 6-parted, somewhat bilabiate, with outer perianth lobes narrower than the inner; upper petal expanded and with yellow spot. Stamens 6, unequal, the 3 shorter included with-

in the throat. Ovary superior, 3-celled, many-ovulate; style elongate; stigma hairy. Fruit a capsule.

a. Petioles more or less inflated; plant with a short, condensed stem, many roots springing from the base; perianth lobes entire ..... 1. E. CRASSIPES
aa. Petioles not inflated; plant with ascending stem, roots often springing from the nodes; margin of perianth lobes erose ..... 2. E. AZUREA

1. EICHHORNIA CRASSIPES (Mart.) Solms in DC. Monogr. 4:527. 1883.

Pontederia crassipes Mart. Nov. Gen. 1:9. 1824.
Pontederia azurea Hook. Bot. Mag. *pl. 2932*. 1829, excl. syn., not *P. azurea* Sw.
Piaropus crassipes (Mart.) Raf. Fl. Tell. 2:81. 1837.
Piaropus mesomelas Raf. loc. cit. 1837.
Piaropus tricolor Raf. loc. cit. 1837.
Eichhornia speciosa Kunth, Enum. Pl. 4:131. 1843.
Heteranthera formosa Miq. Linnaea 17:61. 1843.
Pontederia elongata Balf. Proc. Bot. Soc. Edinb. 1855:50. 1855.
Eichhornia crassicaulis Schlecht. Abh. Nat. Ges. Halle 6:177. 1862.
Pontederia crassicaulis Schlecht. loc. cit. 1862.
Piaropus crassipes (Mart.) Britton, Ann. N. Y. Acad. 7:241. 1893.
Eichhornia cordifolia Gandog. Bull. Soc. Bot. Fr. 66:294. 1920.

Floating plants with short, condensed stems and many long, pendant, plumose roots inserted at the stem base; new plants arising through branching and often remaining attached to the parent plant for considerable lengths of time. Leaves with expanded orbicular blades up to 8 cm. broad, and stipulate petioles 2–30 cm. long, petioles excessively inflated in short-petioled leaves, scarcely inflated in very long-petioled leaves. Inflorescence 4–15 cm. long, lightly pubescent with gland-tipped hairs, 4- to 14-flowered. Spathe sub-ensheathing the showy spicate inflorescence. Flowers lavender, 4–6 cm. long, upper petal with a darker purple-blue blotch bearing a yellow spot in the center; tube narrow, about 1.6 cm. long; sepals slightly narrower than the petals; stamens unequal, the 3 longer well exserted, the 3 shorter scarcely extending beyond the tube; filaments glandular-pubescent, adnate to the tube, those of the longer stamens about 2 cm. long, those of the shorter about 0.5 cm. long; anthers linear-oblong, 2-lobed, versatile, about 2.5 mm. long; style elongate with a mop-like capitate stigma. Ovary 3-carpellary, many-ovulate. Seeds 1.2 mm. long, 0.5–0.6 mm. wide.

United States to Paraguay and the Antilles. Naturalized throughout the tropics of the world. The Water Hyacinth multiplies to such an extent that it frequently chokes waterways and becomes a menace to navigation.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *von Wedel 415*. CANAL ZONE: Gatún Lake, *Allen 1965*. CHIRIQUÍ: swamp, Boquete, alt. 3800 ft., *Davidson 613; Woodson & Schery 743*.

2. EICHHORNIA AZUREA (Sw.) Kunth, Enum. Pl. 4:129. 1843.

Pontederia azurea Sw. Prodr. 57. 1788.
Pontederia aquatica Vell. Fl. Flum. 144. 1825.
Piaropus azureus (Sw.) Raf. Fl. Tell. 2:81. 1837.
Eichhornia aquatica (Vell.) Schlecht. Abh. Nat. Ges. Halle 6:177. 1862.

Plants rooting in the mud or sometimes floating; stems elongate with plumose pendent roots inserted at the nodes. Leaves with orbicular or obovate blades up to 15 cm. broad and fleshy uninflated, stipulate petioles up to 30 cm. long. Spathe

sub-ensheathing the many-flowered spike. Spike 4–15 cm. long with many purplish-blue flowers. Flowers 3.5–5.5 cm. long, the tube about 2 cm. long, glandular-pubescent; perianth lobes spreading, decurrent, erose-margined, 1.5–3.5 cm. long, the upper one with a dark purple base topped by a yellow blotch; petals 3–4 times broader than sepals; stamens unequal, filaments glandular-pubescent, adnate to the tube; stigma red, capitate; style glabrous, about 2 cm. long; ovary 3-carpellary, many-ovulate. Seed 1.0–1.6 mm. long, 0.5–0.8 mm. wide.

Mexico to Argentina and the Antilles.

BOCAS DEL TORO: indefinite, *Cooper 171*. CANAL ZONE: Río Chagres, *Fairchild 2043*; Madden Lake, *Woodson & Schery 957*.

3. PONTEDERIA L.

PONTEDERIA L. Sp. Pl. 288. 1753.
Narukila Adans. Fam. 2:54. 1763.
Unisema Raf. Med. Repos. II. 5:352. 1808.

Perennial marsh or aquatic herbs. Leaves petioled, erect, blade narrow or broad. Inflorescence short or long-spicate, pedunculate, with basal spathe. Spadix and outer perianth more or less hairy, often glandular. Perianth bilabiate, lower 3 segments free, upper 3 adnate for their basal half, middle lobe expanded and with yellow spot. Stamens 6, unequal, posterior 3 included in the throat, filaments adnate toward their base. Ovary with 1 fertile cell containing a single anatropous ovule; style elongate, slender. Fruit achenoid, with persistent style and perianth parts and several protruding or ridge-like crests.

a. Inflorescence about as broad or broader than long; many rod-shaped glands in hairs at base of the flowers, colorless and inconspicuous in living plants; spathe sub-ensheathing the inflorescence; fruit spiny, appearing bur-like; plant suberect, prostrate-floating, or ascending ..... 1. P. ROTUNDIFOLIA

aa. Inflorescence longer than broad; glands, if present, globular; inflorescence usually well exserted from the spathe; fruit with longitudinal ridge-like crests; plant erect ..... 2. P. CORDATA

Fig 168
Pontederia rotundifolia

1. PONTEDERIA ROTUNDIFOLIA L. f. Suppl. 192. 1781.

Pontederia cordifolia Mar.; R. & S. Syst. Veg. 7:1142. 1830.
Unisema orbiculata Raf. Med. Fl. 2:108. 1830.
Pontederia eriantha Miq. Linnaea 17:60. 1843.

Plants rooting or creeping in the mud, with stems prostrate-ascending or floating. Leaves (or lower spathe valve) with ovate, sagittate, or reniform-cordate blade, up to 12 cm. long and 18 cm. broad; stipulate petiole up to 25 cm. long, slightly dilated for its lower half. Spathe sub-ensheathing the shortly spicate inflorescence; rachis pilose. Flowers condensed on rachis, 1.7–2.2 cm. long, more or less pilose and light-translucent except for few to many red-brown resin streaks prominent on the expanded perianth segments; tube about 1 cm. long, glandular-pubescent with rod-shaped glands, 2–3 mm. long; upper

corolla lobe expanded and with twin yellow blotches, one on each side of mid-vein (often inconspicuous in fresh flowers), fused toward the base to the adjacent calyx lobes; calyx lobes slightly narrower than the corolla lobes, about 7 mm. long; filaments adnate to the tube at different levels, glandular-pubescent, up to 9 mm. long; anthers narrowly ovate, narrowed toward the apex, 1–1.5 mm. long; fully developed style 1.5 cm. long, with a subcapitate 6-lobed stigma. Fruit ovoid, spiny, about 6–7 mm. long.

Mexico to Uruguay.

CANAL ZONE: Río Chagres near Gamboa, *Allen 1963*; Madden Lake, *Woodson & Schery 949*; Miraflores Lake, *Hunter & Allen 776*.

2. PONTEDERIA CORDATA L. Sp. Pl. 288. 1753.

Pontederia angustifolia Pursh, Fl. Am. Sept. 224. 1814.
Narukila cordata (L.) Nieuwl. Am. Midl. Nat. 3:101. 1913.
Unisema cordata (L.) Farwell, Papers Mich. Acad. 3:91. 1924.

Plant erect, emersed, up to 15 dm. tall, rooted in the mud. Petiole elongate, stipulate; leaf blade lanceolate, oblong-lanceolate, cordate, hastate, or sagittate, 3–20 cm. long, 2–15 cm. broad. Spathe loosely ensheathing the lower rachis, with inflorescence usually well exserted; inflorescence longer than broad, 3–13 cm. long; rachis and base of flowers lightly pubescent, sometimes glabrate in age, if glandular-pubescent the glands globular and less than 0.1 mm. in diameter. Flowers white to blue, 8–15 mm. long; tube 5–9 mm. long; stamens unequally adnate to the tube, the 3 lower not exserted beyond the tube; anthers orbicular or oblongoid, about 0.7 mm. long; filaments up to 9 mm. long; style elongate, about 8 mm. long, with a subcapitate, inconspicuously lobed stigma. Fruit oblong-pyriform or ovoid-pyriform, 4–7 mm. long, with longitudinal ridge-like crests.

The familiar Pickerel-weed of the United States and Canada. Three varieties are widespread in the New World tropics; of these only the first enumerated is represented in Panama by existing records, although the two following are also to be expected.

PONTEDERIA CORDATA var. **parviflora** (E. J. Alexander) Schery, comb. nov.

Pontederia parviflora E. J. Alexander, N. Am. Flora 19:1. 1937.

Fig. 169
Pontederia cordata var. *parviflora*

Leaves almost as broad to half as broad as long, not cordate or only very shallowly so. Inflorescence stocky. Flowers eglandular, 8–12 mm. long, more or less densely villous, hairs with a yellowish cast. Fruit longer than broad, with lacerate crests.

Panama.

COCLÉ: Aguadulce, *Pittier 4915*. HERRERA: Pesé, *Allen 790*. PANAMÁ: swamp on Río Jagua, near El Congor Hill, alt. 2 m., *Hunter & Allen 466*; between Panamá and Chepo, *Woodson, Allen & Seibert 1661*; *Dodge, Hunter, Steyermark & Allen 16702*; Santa María, *Allen 790*.

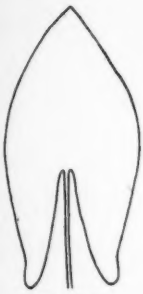

Fig. 170
Pontederia cordata var. *sagittata*

PONTEDERIA CORDATA var. **sagittata** (Presl) Schery, comb. nov.

Pontederia sagittata Presl, Rel. Haenk. 1:116. 1827.
Pontederia cordata f. *sagittata* Solms, in DC. Monogr. 4:533. 1883.

Leaf as broad to half as broad as long, deeply cordate, sagittate or hastate, basal lobes not spreading, nearly parallel. Inflorescence stocky. Flowers usually somewhat glandular at base, slightly villous to glabrate, 8–12 mm. long. Fruit almost as broad or as broad as long, crests scarcely lacerate.

Mexico, Guatemala, Honduras, probably extending to Panama.

Fig. 171
Pontederia cordata var. *lanceolata*

PONTEDERIA CORDATA var. lanceolata Griseb. Cat. Pl. Cuba. 252. 1866.

? *Unisema sagittata* Raf. Fl. Ludovic. 18. 1817.
Pontederia lanceolata Nutt. Gen. 1:216. 1818.
Pontederia lancifolia Ell. Sketch Bot. S. Car. & Ga. 1:382. 1821, non Muhl.
Pontederia cordata var. *typica* Solms, in DC. Monogr. 4:532. 1883, in part.
Pontederia lanceolata f. *brasiliensis* Fernald, Rhodora 27:81. 1925.
Pontederia lanceolata f. *trullifolia* Fernald, loc. cit. 1925.

Leaf 2–4 times as long as broad, lanceolate, more or less cordate, basal lobes spreading from the petiole. Inflorescence extended, erect. Flowers glandular or hirtellous, 12–16 mm. long. Fruit almost as broad or as broad as long, margins shallowly lacerate.

Mexico to Argentina, but not yet reported from Panama.

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